YEARBOOK

OF THE

UNITED STATES DEPARTMENT OF AGRICULTURE.

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[CHAPTER 23, Stat. at L., 1895.]

[AN ACT Providing for the public printing and binding and the distribution of public documents.]

Section 73, paragraph 2:

The Annual Report of the Secretary of Agriculture shall hereafter be submitted and printed in two parts, as follows: Part One, which shall contain purely business and executive matter which it is necessary for the Secretary to submit to the President and Congress; Part Two, which shall contain such reports from the different Bureaus and Divisions, and such papers prepared by their special agents, accompanied by suitable illustrations, as shall, in the opinion of the Secretary, be specially suited to interest and instruct the farmers of the country, and to include a general report of the operations of the Department for their information. There shall be printed of Part One, one thousand copies for the Senate, two thousand copies for the House, and three thousand copies for the Department of Agriculture; and of Part Two, one hundred and ten thousand copies for the use of the Senate, three hundred and sixty thousand copies for the use of the House of Representatives, and thirty thousand copies for the use of the Department of Agriculture, the illustrations for the same to be executed under the supervision of the Public Printer, in accordance with directions of the Joint Committee on Printing, said illustrations to be subject to the approval of the Secretary of Agriculture; and the title of each of the said parts shall be such as to show that such part is complete in itself.

PREFACE.

The present volume is the sixteenth Yearbook of the Department of Agriculture. It does not differ materially from the preceding ones except in the number of pages it contains, this volume being shorter by 166 pages than that for 1908. This reduction in size was not accomplished without considerable difficulty, since it involved the exclusion of some valuable papers and the elimination of some interesting features of the Appendix. The reasons for reducing the size were: (1) To secure a less bulky book, which can be handled and transmitted through the mails more conveniently; (2) a smaller volume can be more securely bound and therefore presents a better appearance; (3) to insure publication at an early date, it being the expectation and earnest desire of the Secretary that this Yearbook be issued and made available for distribution on or before May 1 instead of in July or August, as heretofore; and (4) the urgent necessity for economy in expenditures from the printing fund.

The decrease in size has been effected not only by including fewer articles but by condensing them, and by eliminating the less important features of the Appendix, which this year occupies but 202 pages. The statistics of production, values, exports, and imports of agricultural products are given with even greater fullness than usual. The tables showing domestic production of crops and farm animals by States have been improved by grouping the States in conformity with the methods of the Federal Census. In the tables for world's production of wheat, corn, oats, rye, barley, and flaxseed, this year for the first time acreages are given as well as yields. Two special tables are presented which are of great value and represent a large amount of research—"Rice crops of the United States, 1712–1909," and "Hop crops of the United States, 1790–1909." The tables of transportation rates are fuller than usual. There is one new table showing ocean freight rates on grain and cotton from several leading ports of the United States to Europe, and another showing average receipts per ton per mile for freight transportation on the railroads of the United States, divided into ten groups.

The preparation of the statistical tables is a work of considerable magnitude. Most of the reports upon which they are based can not be received until after the close of the year; then the figures have to be carefully tabulated, and the accuracy of the work must be verified by mathematical tests and by comparing the figures with

the originals. Such work requires considerable time. This year the statistical matter was prepared with more expedition and furnished for publication earlier than ever before, a fact which has contributed largely to the early issue of the Yearbook.

The directory of officials of various agricultural and kindred associations has been omitted because it was impossible to allot sufficient space to accommodate all organizations of this class, and because of the delay experienced in securing accurate information in regard to such organizations.

The usual review of the weather conditions for the year 1909, greatly condensed, and the lists of officials of agricultural colleges and experiment stations and State officials in charge of agriculture have been retained.

In compliance with the law requiring that the Yearbook shall contain a "general report of the operations of the Department," the Secretary's report has been included, and as usual has first place. The twenty-three papers which follow it are all new and here published for the first time. The list given in the table of contents shows a variety of interesting topics treated by the experts of the Department. Most of these papers are of permanent value, making the volume well worth preservation. In fact, the series of Yearbooks make up an excellent farm library, and such a library may be found in many farm homes throughout the United States.

As a matter of information, it may be stated that it is customary to reprint these papers in separate form for free distribution as a convenient and economical method for making the information in them available for dissemination after the supply of the Yearbook is exhausted.

The illustrations in this volume comprise thirty-six text figures and thirty-six full-page plates, eleven of which are colored.

It is now very generally known that the Yearbook is distributed principally by Senators, Representatives, and Delegates in Congress, and that the Department's quota is used to supply its correspondents, whose only compensation for the valuable service they render is the publications they receive.

It is earnestly hoped by the Secretary that the Yearbook for 1909 may fully sustain the reputation which this annual—the most important publication of the Department—has achieved.

JOS. A. ARNOLD,
Department Editor.

WASHINGTON, D. C., *April 1, 1910*

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YEARBOOK

OF THE

U. S. DEPARTMENT OF AGRICULTURE.

REPORT OF THE SECRETARY.

Mr. PRESIDENT:

I respectfully present my Thirteenth Annual Report, covering the work of the Department of Agriculture for the year 1909.

A review of the agricultural production of 1909 is first given. Next, the results of a careful study of the prices of meat are offered, and this discussion is followed by a consideration of the extent to which the farmer has shared in the benefits of generally rising prices. The remainder of the report is taken up with an account, in greater or less detail, of the Department's work during the year.

AGRICULTURAL PRODUCTION OF 1909.

VALUE MUCH HIGHER THAN FOR ANY PREVIOUS YEAR.

MOST PROSPEROUS OF ALL YEARS.

Most prosperous of all years is the place to which 1909 is entitled in agriculture. The yield has been bountiful with most crops, and prices have been high. Advantageously situated as he is in most respects, the farmer is less and less generally compelled to dump his crops on the market at time of harvest. He does not need to work for his board and clothes, as he often did in the former time when prices were so low as to be unprofitable.

VALUE OF ALL PRODUCTS.

The value of the farm products is so incomprehensibly large that it has become merely a row of figures. For this year it is $8,760,000,000; the gain of this year over the preceding one is $869,000,000.

Ten years ago the value of the products of the farm was only five and one-half times the mere gain of this year over 1908; it was little more than one-half of the total value of this year. The value of the products has nearly doubled in ten years.

If the total value of the farm products in 1899, as established by the census, is placed at 100, the value for 1903 is represented by 125,

for 1904 by 130, for 1905 by 135, for 1906 by 143, for 1907 by 159, for 1908 by 167, and for 1909 by 186.

Eleven years of agriculture, beginning with a production of $4,417,000,000 and ending with $8,760,000,000! A sum of $70,000,000,000 for the period!

It has paid off mortgages, it has established banks, it has made better homes, it has helped to make the farmer a citizen of the world, it has provided him with means for improving his soil and making it more productive.

CHIEF CROPS.

In the statement that follows concerning the crop quantities and values for 1909 no figures should be accepted as anticipating the final estimates of this Department to be made later. Only approximations can be adopted, such as could be made by any competent person outside of this Department.

CORN.

The most striking fact in the world's agriculture is the value of the corn crop of 1909 in this country. It is about $1,720,000,000.

It nearly equals the value of the clothing and personal adornments of 76,000,000 people, according to the census of 1900. The gold and silver coin and bullion of the United States are not of greater value.

This corn came up from the soil and out of the air in one hundred and twenty days—$14,000,000 a day for one crop, nearly enough for two dreadnoughts daily, for peace or war.

The value of this corn crop is the highest of record and it is greater than the average of the five preceding years by 36 per cent, while the farm price per bushel is greater by 32 per cent. The price per bushel on November 1, 62.2 cents, has been exceeded in only two years in the records of the Department of Agriculture, beginning with 1866.

In quantity of production this year's corn crop stands second, with 2,767,000,000 bushels, being exceeded by the crop of 1906, but it is greater than the average crop of the five preceding years by 3.5 per cent.

COTTON.

Cotton is now by far the second crop in value, and this year's crop is easily the most valuable one to the farmer that has been produced. With cotton lint selling at 13.7 cents at the farm November 1, and cotton seed selling for about $25 per ton, the lint and seed of this crop are worth about $850,000,000 to the farmer. No other cotton crop since 1873 has been sold by farmers for as high a price per pound as this one.

There have been three cotton crops of more than 13,500,000 bales of 500 pounds gross weight, the first one being in 1904, and commercial

expectations are that the crop of this year will be below the average of the five years preceding.

WHEAT.

Third in order of value among the crops is wheat, worth about $725,000,000 at the farm, and this exceeds all previous values by a large amount. The November farm price was almost an even $1 per bushel, and its equal can not be found until as long ago as 1881. The total value of this year's crop is greater than the five-year average by 34.6 per cent.

In 1901 and in 1906 slightly larger crops of wheat were produced, so that the yield of this year, 725,000,000 bushels, is third in size.

HAY.

For years hay and wheat disputed with each other the honor of the place next after cotton in value, but this year the separation is distinct, and hay, with its value of about $665,000,000, is considerably below wheat and far below cotton. Only in one year, 1907, has its value been overtopped, and it is 10 per cent above the five-year average. The quantity of the hay crop, 64,000,000 tons, has several times been greater than it is this year, although it is now 2.6 per cent above the average of five years preceding.

OATS.

The fifth crop in order of value is oats, worth this year at the farm about $400,000,000, which is considerably above high-water mark, and is greater than the five-year average by 28 per cent. The price of November 1, 41 cents, is high, and only in 1907 and 1908 has it been higher since 1890. In production this crop is very nearly a leader, with its 984,000,000 bushels, and would have been a leader had not the crop of 1902 been about 4,000,000 bushels larger. It is greater than the five-year average by over 12 per cent.

POTATOES.

This year's crop of potatoes is more valuable than any one before produced and is worth about $212,000,000. It is above the five-year average by 25 per cent. The November price, 57.8 cents per bushel, has often been exceeded.

The large production is what makes the crop so valuable, a production that has not been equaled; it is 367,000,000 bushels, or 24 per cent above the five-year average.

TOBACCO.

Tobacco is now marketed under circumstances that secure a higher price per pound than farmers have received since 1865, except in two

or three years. Since 1905 the farm price has been 10 cents or better. The farm value of this year's crop is a little under $100,000,000 and has not been equaled. It is nearly 50 per cent above the five-year average. This great value is principally due to the fact that the crop is the largest ever raised, with about 900,000,000 pounds, or one-third greater than the average of five years.

SUGAR.

It is too early to foresee the amount of the beet sugar of this year's campaign, but the indications are about 500,000 short tons, or a greater crop than any before produced. The value of the sugar and of the beet pulp for feeding purposes is about $47,000,000, an amount that has not been reached in any earlier year.

If the commercial estimate of 364,000 short tons for raw cane sugar is accepted, it is a little below the record of half a dozen years. The value of the cane sugar, molasses, and sirup is placed at $40,000,000.

With fulfillment of expectations, the entire sugar crop will be about 864,000 tons (refined beet sugar and raw cane sugar), and the value of all sugar, molasses, and sirup, from farm and factory, will reach about $95,000,000, so that for quantity of total sugar and value of total sugar, molasses, and sirup, this year is a leading one.

BARLEY.

Barley has receded from its very high price of 1907, but still has a price, 53.3 cents per bushel November 1, which has not been equaled since 1890, except in 1907 and 1908. The farm value of this year's crop is nearly $88,000,000, which has been exceeded only twice, and is 15 per cent over the average of the previous five years.

The production, 165,000,000 bushels, is third in quantity, although, compared with five years before, it is 6 per cent higher.

FLAXSEED.

The production of flaxseed seems to be declining, and the crop of this year is estimated at 25,767,000 bushels, a trifle under the five-year average. But the value of the seed per bushel, $1.398, is the highest since the Bureau of Statistics began to ascertain the farm price in 1902, and the crop is worth $36,000,000, or considerably more than ever before, and 40 per cent over the average of the previous five years.

RICE.

The estimate of rough rice production this year is a little over 1,000,000,000 pounds, an amount considerably above the highest pre-

vious crop. It is 21 per cent over the five-year average. The lead of the value is even more pronounced, since the price is high, and the total for the crop is about $25,000,000.

RYE.

Rye is a crop that remains at almost constant production, about 31,000,000 bushels, and the value this year is about $23,000,000, which has often been exceeded.

HOPS.

A shortage in the world's crop of hops this year raised the price to a high figure, about 33 cents for New York and about 24 cents for the Pacific Northwest. It happened, however, that a large proportion of the Pacific coast crop had been contracted for last year at about 9 cents, so that the average price paid for the whole crop is not as high as market prices indicate. The quantity of the hop crop this year is below the five-year average, but the value is about $8,000,000, or next to the highest year.

ALL CEREALS.

Although a bushel of oats weighs less than a bushel of other cereals, yet there is considerable significance in comparing the total quantity of all cereals in recent years. The total for 1909 is 4,711,000,000 bushels, an amount considerably greater than that for any other year except 1906, when the total was 4,872,000,000 bushels. The average of five years is exceeded in 1909 by 6.5 per cent.

The farm value of all cereals in 1909 has never been equaled in a previous year. It is almost exactly $3,000,000,000, or 34 per cent above the five-year average.

SUMMARY OF COMPARISONS.

Compared with the average of the preceding five years, every one of the crops particularized in the foregoing was larger, except cotton, flaxseed, hops, and cane sugar. Without exception every crop was worth more to the farmer than the five-year average.

This is the year of highest production for potatoes, tobacco, beet sugar, all sugar, and rice; a year of next to the highest production for corn, oats, and all cereals; the crop third in size for wheat.

For value, the amount has not been equaled in the case of corn, cotton, wheat, oats, all cereals, potatoes, beet sugar, all sugar, flaxseed, and rice; the year is next to the highest for hay, cane sugar, and hops; and the barley crop is third in value.

Compared with 1908, this year's gains in value of farm products are found all along the line, the exceptions being barley, buckwheat,

rye, and milk. The increase for cotton—lint and seed—is $208,000,000; wheat, $107,000,000; corn, $105,000,000; hay, $29,000,000; oats, $22,000,000; tobacco, $18,000,000; potatoes, $15,000,000.

There were substantial gains in value of dairy and poultry products and of animals sold and slaughtered. The price of butter has not been so high in many years, and the same is true for eggs and dressed poultry, and, except for the higher price of last year, is also true for milk.

In the grand total, the farm products of 1909 are greater in value than those of 1908 by $869,000,000, or by enough to buy a new equipment of farm machinery for over 6,000,000 farms.

All cereal crops of 1909 are worth $3,000,000,000 to the farmer, an amount that would pay for all of the machinery, tools, and implements of the entire manufacturing industry in this country.

All crops are worth $5,700,000,000, which would make a half payment on the value of all steam railroads, according to the valuation of 1904. All animal products are worth over $3,000,000,000.

The total of all items is $8,760,000,000. In eleven years of application of mind, muscle, and machine to this basic industry of mankind, the wealth produced by farmers, estimated as previously described, is valued at $70,000,000,000.

FOREIGN TRADE IN AGRICULTURAL PRODUCTS.

The value of the agricultural exports of domestic products for the year ending June 30, 1909, has been exceeded in four years—in 1901, 1906, 1907, and 1908. The value for 1909 is $903,000,000, or $151,000,000 below the highest record in 1907, and $114,000,000 below the next highest in 1908.

Compared with 1908, the prominent decreases were $11,500,000 for live animals, $26,000,000 for packing-house products, $20,000,000 for cotton, $55,000,000 for grain and grain products, and $3,800,000 for tobacco. On the other hand, there was an increase of over $7,000,000 in exports of oil cake, oil-cake meal, and vegetable oils.

The domestic exports of beef and beef products declined from 579,000,000 pounds in 1908 to 419,000,000 pounds in 1909; of pork and pork products, from 1,237,000,000 to 1,053,000,000 pounds; of wheat, from 100,000,000 to 67,000,000 bushels; of wheat flour, from 14,000,000 to 10,500,000 barrels; of wheat and wheat flour in terms of wheat, from 163,000,000 bushels in 1908 to 114,000,000 bushels in 1909.

The imports of agricultural products were never so high in value as they were in 1909, the amount being $637,000,000. Principal gains were $15,000,000 in silk, $21,500,000 in wool, $25,600,000 in packing-house products, mostly hides, $11,400,000 in coffee, and $16,500,000 in sugar.

After allowing for the $10,000,000 in exports of foreign origin, the net balance of foreign trade in agricultural products in favor of this country is $256,000,000, the lowest amount since 1896. This was more because of increased imports than of decreased domestic exports. The balance of trade in favor of this country in products other than agricultural for 1909 is $46,000,000.

In foreign trade in forest products the exports of domestic origin were valued at $72,000,000, an amount that has been exceeded in only three years; compared with 1908, there was a loss in all prominent items. The imports of forest products had a value of $124,000,000 and were never before so large in value. India rubber gained $25,000,000, compared with 1908. With respect to the balance of trade in forest products, it was against this country by about $47,000,000.

The agricultural production of 1909 must add much to the prosperity of farmers. The record is unexampled in wealth produced and tells of abundance in quantity. Year by year the farmer is better and better prepared to provide the capital and make the expenditures needed to improve his agriculture and to educate his children for farm life and work.

PRICES OF MEAT.

INCREASE OF RETAIL PRICE OVER WHOLESALE.

SPECIAL INVESTIGATION.

High prices of fresh meats and of their products are of such concern to nearly every family that an examination of the subject is timely. With over two-fifths of the expenditures of the families of medium income devoted to food and with one-third of the national dietary composed of meat, the present situation is felt by the incomes of 19,000,000 families.

The higher prices of meat in recent years do not bear the less heavily on the consumer because its purveyors at various points along the line of distribution may not have raised the price in a larger degree than the price of the animal has increased. There may be too large a net profit or gross profit, or the distributive processes may be too costly at some point. Little definite information has heretofore been extracted from the retail meat business concerning its cheapness or costliness in comparison with the amount of business done, and an acquaintance with the facts has become desirable.

Through employees of the Bureau of Animal Industry inquiries were made in 50 cities—large, medium, and small—in all parts of the country. A schedule was provided to record the actual experience

of retailers in buying and selling the carcass or half carcass of beef. Among the facts ascertained were the weight and wholesale cost of a certain piece of beef, usually a half carcass. Then followed the weight and retail price of every cut for which a uniform price was charged by the dealer. Thus it became possible not only to compare high and low priced cuts, from the point of view of expense to consumer, but also to compute accurately the total retail price per pound and the total retail cost of the beef piece for which the wholesale price per pound and the total wholesale cost had been reported.

FACTS DISCOVERED IN FIFTY CITIES.

In the North Atlantic States the retail price of beef is 31.4 per cent higher than the wholesale price; and the percentage is usually lower in the larger cities than in the smaller ones, and higher in the case of beef that is cheap at wholesale than of high-priced beef.

In Allentown, Pa., there is an immediate gross profit of 50 per cent—that is, the total amount charged at retail is 50 per cent above the wholesale cost. Such gross profits are noticed for the smaller places as 46 per cent for Canajoharie, N. Y.; 50 per cent for Cortland, N. Y.; 47 per cent for Holyoke, Mass., and for Harrisburg, Pa. But for Olean, N. Y., the percentage is only 23 and for Springfield, Mass., 19, the low price being in strong contrast with the 47 per cent for Holyoke, its near neighbor, with a different sort of inhabitants.

A gross profit of 20 per cent was found in New York, N. Y., and Philadelphia, Pa.; 28 per cent in Buffalo, N. Y., and 36 per cent in Boston, Mass.

Everywhere appears the general fact that the lower the grade of beef the greater the percentage of gross profit. Allentown's high percentage is based on wholesale prices of 7½ and 8½ cents. In Boston the rate of gross profit is twice as great for 8-cent beef as for beef costing 11 and 14½ cents. Indeed, the rule is quite general that low-priced beef is marked up twice as much relatively as high-priced beef is. In other words, perhaps it is a safe inference that the poorer people pay nearly twice the gross profit that the more well-to-do people pay.

Baltimore, Md., in the South Atlantic States, is another large city with a low rate of gross profit, 17 per cent; but Washington, D. C., has a much higher rate, 42 per cent, and Takoma Park, D. C., 44 per cent. Richmond, Va., has the low rate of 21 per cent, and Augusta, Ga., the high one of 61 per cent. The amount for the South Atlantic States is 38 per cent.

In the North Central States the mean is 38 per cent, and the foregoing observations apply concerning the higher rate of gross profit for cheap beef. The Chicago, Ill., returns are for cheap beef, and the

gross retail profit is 46 per cent, but in Cincinnati, Ohio, it is only 25 per cent; Omaha, Nebr., 23 per cent; South Omaha, Nebr., 25 per cent. Kansas City, Kans., has a cheap-beef gross profit of 50 per cent, while Kansas City, Mo., reports only 28 per cent.

For the twin cities, Minneapolis and St. Paul, Minn., the gross profit is reported at 27 and 35 per cent, respectively; for Detroit, Mich., and Milwaukee, Wis., 40 per cent; and for St. Louis, Mo., 39 per cent. In the smaller places the rates of gross profit in selling beef are 52 per cent for Alton, Ill.; 53 per cent for Cedar Rapids, Iowa; 43 per cent for East Liverpool, Ohio; 31 per cent for Port Huron, Mich.; 49 per cent for Wichita, Kans.; and 27 per cent for Winona, Minn.

No other division of States stands as high in gross profit as the South Central States, with 54 per cent. The places with rates above this mean are Fort Smith, Ark., 57 per cent; Mobile, Ala., 64 per cent; Nashville, Tenn., 63 per cent; Natchez, Miss., 56 per cent; and Shreveport, La., 68 per cent. On the other hand, Fort Worth, Tex., reports only 38 per cent; Louisville, Ky., 52 per cent; and Memphis, Tenn., 32 per cent.

The mean of 39.4 per cent of gross profit is derived from reports from the Western States. The highest rate is 62 per cent for Lewiston, Idaho; next, is 58 per cent for Spokane, Wash.; 50 per cent for Ogden, Utah; 39 per cent for San Francisco, Cal., and Cheyenne, Wyo.; 37 per cent for Denver, Colo.; 24 per cent for Seattle, Wash.; and 16 per cent for Tacoma, Wash.

For the 50 cities throughout the United States for which reports were received, the mean gross profit in selling beef, that is, the total retail cost charged to consumers above the wholesale cost paid by the retailers, is 38 per cent. In 5 cities the rate of increase is 20 per cent or under; in 10 cities, 21 to 30 per cent; in 12 cities, 31 to 40 per cent; in 12 cities, 41 to 50 per cent; and in 11 cities over 50 per cent.

RETAIL COSTS.

There are some services connected with a retail meat or meat and grocery business in a city that customers desire for their accommodation which are costly to them. They want delivery of goods, perhaps by special trip, and this requires at least one man, horse, and wagon. They want the market man also to send a man to their dwellings to take orders.

Much more productive of costliness to the retail distribution of meat is the overdoing of the retail business. The multiplication of small shops is a burden to consumers and no source of riches to the small shopkeepers. When twenty or more small shops divide the retail business within the area that could be served by one large shop,

the expenses of the many shops for labor, horses, rent, and other things that are in excess of what would be sufficient for the one shop must go into the retail prices of the meat sold.

Furthermore, customers are disposed to focus their choice of cuts on certain ones, and these naturally bear the higher prices. If the porterhouse steak is really beyond the cash or credit of the customer, then a sirloin must be had, and a rib roast instead of another cut for roasting. Steaks and roasts are the preferences of beef customers, and the steaks and roasts must have names that are regarded as respectable. Consequently one-fifth of the carcass is bought at the highest prices—porterhouse steak at 25 to 30 cents a pound, sirloin at 20 to 25 cents, and rib roasts at 20 cents—these being some of the prices noted in the returns received from the 50 cities.

CONDITIONS AFFECTING MEAT SUPPLY.

PER CAPITA CONSUMPTION.

Among the peoples of the earth, except those of Australasia, the inhabitants of the United States are the most liberal meat eaters. Investigations made by this Department have disclosed the fact that the per capita consumption of meat in this country, in terms of "dressed" meat, was 185.8 pounds in 1900. If the edible parts outside of that description are included, such as heart, liver, tongue, and so on, the consumption was 220.5 pounds. If all this is reduced to strictly edible meat by exclusion of bones and other nonedible parts, the per capita meat consumption of men, women, children, and babies—that is, the average for all inhabitants—was 182.6 pounds in 1900.

The meat consumption of other countries is usually stated in terms of "dressed" meat, but may include some extraneous parts. As compared with 185.8 pounds of dressed weight of meat, standing as the per capita consumption of the United States, Cuba follows next in order with 124 pounds; the United Kingdom, 121.3 pounds; Germany, 115.94 pounds; France, 78.9 pounds; Denmark, 76 pounds; Belgium, 70 pounds; Sweden, 62 pounds. The average for Australia is apparently 262.6 pounds, and for New Zealand, 212.5 pounds.

The average meat consumption of the United States has long been declining. Primarily, the supply of meat in relation to population has declined since the first live-stock census in 1840. For cattle in that year, excluding calves, there was an average of 0.88 of an animal on farms to each inhabitant, 0.81 of an animal in 1860, 0.79 of an animal in 1880, 0.92 of an animal in 1890, and 0.69 of an animal in 1900. To a considerable extent, at least, range cattle are included. Since 1900, cattle have probably hardly increased absolutely, while population has gained nearly 20 per cent.

The comparison of sheep, excluding lambs, with population, shows that there were 1.13 animals on farms in 1840 to each inhabitant, 0.71 of an animal in 1860, 0.84 of an animal in 1880, 0.65 of an animal in 1890, and 0.52 of an animal in 1900. Range sheep are supposed to be included.

The decline for swine is about as great as that for sheep, and has been uninterrupted. The ratio of swine on farms to population in 1840 was 1.54 animals; in 1860 it was 1.07 animals; in 1880 it was 0.99 of an animal; in 1890 it was 0.92 of an animal; and in 1900 it was 0.83 of an animal.

MEAT EXPORTS.

In the meantime all of the meat produced in this country has not been eaten here. Prodigious exports have gone to all the countries of the globe. The exports of cattle for slaughter rose to 593,000 in 1904, since which time there has been a decline to 208,000 in 1909.

Most of the exports of meat and its products are stated in pounds in the foreign trade reports, and, as far as so stated, the exports of beef and beef products averaged 32,000,000 pounds yearly for 1851–1855, 109,000,000 pounds for 1871–1875, 234,000,000 pounds for 1881–1885, 340,000,000 pounds for 1886–1890, 521,000,000 pounds for 1891–1895, 601,000,000 pounds for 1896–1900, 617,000,000 pounds for 1901–1905, 733,000,000 pounds for 1906, 690,000,000 pounds for 1907, 579,000,000 pounds for 1908, and 419,000,000 pounds for 1909.

The high-water mark of beef exports was in 1906, since which year the decline has been so sharp that the exports of 1909 were only 57 per cent of those of 1906. Notwithstanding industrial depression abroad, evidently this indicated a decline in the supply of beef animals during the last three years relative to consumption in this country, especially since there has been no increased severity in the restrictions of European countries against the importation of beef. The significance of the foregoing is strengthened by the declining exports of beef cattle since 1904.

Pork and its products have far exceeded beef in exports. As far as stated in pounds—and little is omitted—the exports of pork and pork products averaged 91,000,000 pounds yearly in 1851–1855; 496,000,000 pounds in 1871–1875; 826,000,000 pounds in 1881–1885; 1,061,000,000 pounds in 1891–1895; 1,462,000,000 pounds in 1896–1900; 1,242,000,000 pounds in 1901–1905; 1,465,000,000 pounds in 1906; 1,268,000,000 pounds in 1907; 1,237,000,000 pounds in 1908; and for 1909 was 1,053,000,000 pounds.

In less degree than beef, pork exports indicate relatively, if not absolutely, a decline in the national supply in the last three years. While the ratio of meat animals to population has been declining during the last seventy years, exports of meat have grown to the

unexampled total of 2,198,000,000 pounds of beef and pork and their products in 1906, and 593,000 beef cattle in 1904. The cattle exports fell to 208,000 animals in 1909 and the combined beef and pork exports fell to 1,472,000,000 pounds, or about 67 per cent of the high-water mark of three years before.

CHANGE IN DIETARY.

For two reasons the consumption of meat has declined in this country. The stock of meat animals has not been maintained in relation to population, and exports have increased to enormous proportions in a movement which culminated in 1906, to be followed by a sharp decline.

Seventy years ago the per capita consumption of meat was about one-half of the national dietary; in 1900 it had declined to about one-third or a little more; it may now be less than one-third.

If the entire stock of cattle, sheep, and swine are computed into meat pounds for the census years and the exports for those years are deducted, the remaining pounds may be regarded as the stock for national meat supply. Let per capita ratios be computed and let the ratio for 1840 be regarded as 100; then, by 1860, the per capita stock of meat animals declined to 82.5, by 1880 to 72.4, by 1890 to 79.4, and by 1900 to 59.3. In seventy years the per capita stock of animals for the national consumption of meat has declined to less than three-fifths of its former proportions.

It may not be that the people have unwillingly adopted a diminishing meat consumption. The diversification of agriculture and the abundant products of the farm must have had their effects on food habits. Vegetables that are locally out of season are brought from places as far away as 3,000 miles; and so with fruits, and in less degree with berries. The luxuries of former boyhood have become common foods of the present. The canning factory places the vegetable garden, the fruit orchard, and the berry field at the door of every household in the land during every day in the year. There are refrigerator cars for long-distance transportation and warehouses for cold storage. Eggs, dressed poultry, and butter are carried forward from a period of natural oversupply to a period of natural scarcity.

There is general agreement that wheat consumption for food has increased from about 4⅔ bushels to 5½ bushels per capita during the last twenty-five years. Sugar, a concentrated energy-supplying food, increased in consumption per capita from 14.1 pounds in 1840 to 30.5 pounds in 1860, to 42.9 pounds in 1880, to 52.8 pounds in 1890, to 65.2 pounds in 1900, and to 75.4 pounds in 1908.

The yearly consumption of sugar per family has increased since 1875 by 140 pounds. This has probably not fully displaced a nutri-

tive equivalent in meat, but had it done so the displacement of meat in the annual family dietary would have been equal to 264.4 pounds of sirloin beef, or 349.5 pounds of round beef, or 155.9 pounds of cured ham, or 61.7 pounds of lard.

For every 100 pounds of rolled oats added to the national dietary within less than a generation, if there was an equivalent displacement of meat, for protein there would be required 101.7 pounds of sirloin beef, or 87.7 pounds of round beef, or 183.1 pounds of cured bacon; and for energy the equivalent is 187.8 pounds of sirloin beef, or 248.3 pounds of round beef, or 68.9 pounds of cured bacon.

The needed dietary of a certain number of calories can not be extended considerably and continually with impunity to health; so that if more fruits, vegetables, cereals, and sugar are eaten, some meat must be displaced. Meat, however, still remains the most prominent and costly group of foods.

REDUCTION OF RANGES.

As previously stated, the exports for recent years indicate that something has happened to the production or supply of beef. For 1906 and a few years before, the exports had been much above former figures. That was a period of dumping upon the market great numbers of beef cattle on the breaking up of the big western and northwestern range herds consequent upon enforcement of the "no-fence" law by the National Government.

Half a dozen years of this abnormal movement of beef cattle to the great markets began to tell upon the supply in 1908, when the deliveries fell off in a marked degree and the decrease continued in 1909.

Accompanying this drain upon the beef cattle of the country has been the encroachment of the settler upon the range. Former ranges, broad enough for an empire, have been broken by the farmer's plow. The secret of "dry farming" has been discovered, and one item of its achievements is a large proportion of a durum wheat crop of 50,000,000 bushels.

EXTRA DEMAND FOR CORN FOR FEEDING.

While ranges have been exhausted of their cattle, not all of the animals have gone directly to the slaughterhouses. A great proportion of them have found their way to farms for maturing and finishing, largely upon corn. The extra demand upon the corn crop is recorded in corn prices. From 1895 to 1900 the mean farm price of corn was 28 cents. The price of 60.5 cents in 1901 was due to a two-thirds crop because of drought. The price was quite uniform on a higher level from 1902 to 1906, and the mean was 41.6 cents per bushel. The following year it rose to 51.6 cents; in 1908, to 60.6

cents; and in November, 1909, to 62.2 cents. Higher prices coincide with the breaking up of the range herds.

There is no small difference between the cost of beef made on the free or cheap range and the beef fed on 60-cent corn.

BEEF PRODUCED ON HIGH-PRICED LAND.

There must be taken into the reckoning also the difference between the value of the range acre and the farm acre; also the increased value of the farm acre. Investigations by the Department of Agriculture have established a value per acre, including improvements, for farms of a medium sort in the North Central States in 1905, which was an increase of 35.3 per cent in five years. For the Western division of States the value per acre in 1905 was a gain of 40.2 per cent in five years. These are the groups of States that produce the bulk of the beef supply, and the value of farm land in them has subsequently risen above the figures given for 1905.

The increase in the value per acre of medium farms from 1900 to 1905 was 37.4 per cent in Illinois; 42 per cent in Missouri; 70.6 per cent in North Dakota; 65.2 per cent in South Dakota; 54 per cent in Nebraska; 54.7 per cent in Kansas; 44.5 per cent in Montana; and 81.3 per cent in Wyoming.

More profitable crops have made more valuable land, and cheap beef is not the product of high-priced land.

The settler on the dry farming and irrigated tracts where cattle once grazed is thus far not filling the gap in beef production on the range. The new settler must first give his attention to quick cash crops.

DIMINISHED MARKETINGS OF CATTLE AND HOGS.

The Bureau of Animal Industry gave post-mortem inspections to 7,621,717 cattle in the year ending June 30, 1907; to 7,230,272 cattle in 1908; and to 7,325,337 cattle in 1909, embracing all cattle killed for interstate shipment.

Along with the shrinkage in the supply of beef cattle there has been an increased slaughter of calves, thus augmenting the decrease in cattle supply. The inspections of calves after slaughter numbered 1,763,574 in 1907, 1,995,595 in 1908, and 2,046,713 in 1909.

HOGS AND PORK.

With regard to hogs, high-priced corn must have its effect in high-priced pork. Added to this is the recent great reduction in the marketing of hogs. The inspections of 1907 were 31,815,900, of 1908 were 35,008,027, of 1909 were 35,427,321. These years ended June 30. But for the first nine months of the calendar year the receipts of hogs

at the great markets fell from 14,603,700 in 1908 to 12,593,200 in 1909, or 13.8 per cent.

To the industrial disturbance of 1907 is ascribed one cause of the recent diminution in the hog supply. When the bottom fell out of the market late in that year farmers sold brood sows because they were regarded as unprofitable, and the breeding herds thus sacrificed have not been replaced.

Rising prices of beef and pork have strengthened the demand for mutton. The sheep inspected by the Bureau of Animal Industry numbered 9,681,876 in 1907, 9,779,940 in 1908, and 10,802,903 in 1909. Even goats have been affected, since their inspections grew from 46,067 in 1908 to 69,193 in 1909.

In view of the diminished supply of meat animals during the past year, as compared with the population, it is to be expected that stocks of what the commercial papers call "provisions" should be lower than they were a year ago. In 5 chief cities of large storage the stocks of pickled pork decreased from 48,038 barrels October 31, 1908, to 33,991 barrels a year later. Lard decreased from 84,193 to 31,973 tierces during the year and cut meats decreased from 140,853,793 to 89,472,276 pounds.

SUMMARY OF CONCLUSIONS.

The foregoing may now be concisely summarized in a few lines: (1) The production stock of cattle has been diminished by range abandonment; (2) new demands for corn on farms for beef production; (3) high price of corn; (4) high prices of all meat, partly because of high corn prices; (5) the production stock of hogs was reduced in 1907; (6) high farm-land values; (7) both supply and cost of meat production unite to raise meat prices; (8) for seventy years the production of meat has declined relative to population; (9) meat exports increased until 1906, after which they sharply declined; (10) there has been a decreasing meat consumption per capita; (11) increased per capita consumption of cereals, vegetables, fruits, and saccharine foods.

MEAT PRICE MOVEMENTS.

PLAN ADOPTED TO MAKE THEM COMPARABLE.

High meat prices being sensibly felt in the experience of consumers, there is widespread conjecture as to the proportion of the increase received by the various parties from farmer to retail dealer. The foregoing statement concerning factors and conditions of meat production has prepared the way for a critical examination of the price movement of animals and meats. For the purpose of making all things comparable in price movement, a common base is adopted in the manner following.

A period of years is determined upon, beginning with 1896, because that year marks the beginning of the present period of upward movement of average prices of all commodities. The average annual price of the first five years, 1896–1900, is adopted as a base line, or price level, represented by 100, with which the price of each year may be compared upon conversion into a percentage of the price level.

For instance, if the price level or mean annual price of fresh beef of a certain description during 1896–1900 is 7.5 cents and the mean price for 1908 is 9 cents, the price level, 7.5 cents, becomes 100, and the ratio of 9 cents to 7.5 cents is 120, so that the price of 1908 is 20 above the adopted price level.

Whether this computation is made for prices or for other data for the same period of years, all results are comparable one with another, and it is possible to determine, approximately, for illustration, whether the price of steers in Chicago has increased in greater or less degree than the price of fresh beef since 1896.

BEEF PRICES.

Before considering measures of comparative price movements in detail, it may be well to state and remember the measure for all commodities combined. The series of comparative prices index numbers that is adopted for this purpose is one that is everywhere accepted. With the average of the five years 1896–1900 standing for 100, the prices of all commodities reached their highest subsequent point in 1906, when they stood at 126.7; they fell to 116.9 in 1908; and rose to 122.6 in 1909.

NO INCREASE FOR CATTLE.

For cattle other than dairy cows, the annual statistics of the Department of Agriculture show that the latest farm price has fallen below the price level of 1896–1900, that level being placed at 100. The price of cattle for January 1 rose to 110.4 in 1901, descended to 83.9 in 1905, and rose to 93.5 in 1908, and to 96.9 in 1909. Perhaps the price will be shown to have risen to 100 in the investigation of the Bureau of Statistics next January, or to the average with which it began in 1896–1900.

To make certain that the import of the farm price of cattle as above stated is not a mistake for some unperceived reason, the prices of 2-year-old steers have been examined in the unpublished records of the Department of Agriculture. Beginning with a price level of 100 in the first five years of the present period of upward movement of prices, steers of this age reached the price represented by 135.9 in 1900, declined to 85.5 in 1905, and rose to 100.8 in 1909. This is for January 1 and for the United States.

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Within the great cattle-feeding State of Iowa, closely related to the ranges, the price of 2-year-old steers reached as high a point as 133.8 in 1900, dropped to 87.2 in 1905, rose to 109.8 in 1907, again fell to 97.6 in 1908, and in the following year touched 103.7.

West Virginia is somewhat of a cattle-feeding State, but, unlike Iowa, depends more on grass than on corn. In this State the price of 2-year-old steers in 1908 is represented by 114.5, and in 1909 by 118.3; and in Tennessee, another grass State, by 105.7 in 1908, and 112.5 in 1909.

The average for the United States as a whole is determined by the corn-feeding States, and for January 1, 1909, as above stated, had barely been able to rise from the trough of 1905 and reach the price level of 1896–1900.

Without further examination it would thus appear that the farmer has not shared in the upward movement of beef prices, and in some degree this is true. The prices of cattle on the farm are ascertained by the Bureau of Statistics from reports from every township for January 1 of each year, and the averages are regarded as above suspicion. But this marks the beginning of the cattle-feeding period, before corn has been converted into beef. This sort of beef is the product of two raw materials—corn and an animal body in the "raw" state—and such is the animal represented in the farm prices of the Bureau of Statistics, an animal unprepared for Chicago.

SOME RETURN FROM CORN-FED BEEF.

With regard to the prices of beef cattle in the raw state, therefore, the farmer is in about the same position now that he occupied during the first five years of the present price movement. In the matured and finished state, however, his beef cattle have participated to some extent in the advancing prices, as the Chicago prices given below prove. In other words, the farmer has received some share of higher beef prices with respect to corn as a factor of beef making, but has failed to do so with regard to the raw animal. In Chicago, according to a financial authority, the price of the best native steers, expressed comparatively, is 136.4 in 1908 and 139.9 in 1909, the mean for 1896–1900 being represented by 100. Upon the same base line the price of choice to extra steers in the Bureau of Labor's annual reports on wholesale prices is 126.3 for 1908.

Export beef cattle are in a class by themselves to meet international competition. During the fourteen years under review their price was highest in the fiscal year 1897, for which it is represented by 111.4; it declined to 85.6 in 1904; and advanced without interruption to 101 in 1908 and to 104.5 in 1909.

The farm price of corn December 1, 1908, was 212.6, compared with the mean of the five years 1896–1900, and in 1909 the comparative number is 218.6. The matter may now be formally stated as follows:

Item.	Prices index number.	
	1908.	1909.
Two-year-old steers at the farm, not matured or finished, January 1	95.6	100.8
Best native steers, Chicago	136.4	139.9
Choice to extra steers, Chicago	126.3	....
Corn at the farm, December 1	212.6	218.6

It is assumed that the farmer has received his due share of the advance in the Chicago prices of steers; but if so, still he has failed to receive a return corresponding to the increased price of corn in the more recent years, and in these years he has failed to get any increase whatever for his raw animal, except the trace of a gain in 1909.

MARKET RECEIPTS OF CATTLE AND EXPORTS.

The receipts of cattle at Chicago, Kansas City, Omaha, and St. Louis progressed from 5,856,000 in 1896 to 8,170,000 in 1907; then there was a fall to 7,524,000 in 1908, and the number for 1909 will be still lower. The comparative number for the cattle receipts of 1908 is 124.5; for the population of the United States it is 119.3.

The year when the exports of beef were greatest in quantity was 1906, represented by the comparative number 122. Subsequently those exports declined, and the number representing 1909 is 69.7. The great decline in exports and the receipts of cattle at large markets in 1909 would seem to indicate a larger per capita consumption of beef following the industrial depression of 1907–8.

WHOLESALE PRICES OF BEEF.

Pursuing the inquiry another step, wholesale beef prices are to be examined. Their comparison, for 1908, is to be with native steers, represented by 136.4, and with choice to extra steers, 126.3.

One of the large packing-houses has favored the preparation of this matter by contributing the average price of fresh beef sold by it in New York for each of the ten years beginning with 1899. The average prices are between 7 and 8 cents a pound, except 8.52 cents for 1902, 6.97 cents for 1905, and 8.22 cents for 1908. A price level for 1896–1900 being obtained by comparison with prices obtained from other sources, the fresh beef of this packing-house was sold in New York in 1908 at an average price which is represented by 119.8,

a lower relative gain than was made by the classes of steers before mentioned.

A trade paper devoted to the provision interests reports mean prices of common to fair native carcasses in New York for 1908, which are related to the price level of the first five years of the period as 129.7 to 100. For native steer carcasses in New York the comparative price for 1908 warranted by the reports of the Bureau of Labor is 120.1. The mean price of beef carcasses in 1908, reported by a commercial authority, is represented by the comparative number 123.7.

While these numbers permit no fine comparisons with the relative price numbers for the classes of steers that are represented by 136.4 and 126.3, respectively, it is apparent that fresh-beef prices have not increased in greater degree than steer prices have at Chicago. The mean export price of fresh beef in 1908 stands relatively at 118.5; in 1909, at 120.9.

The following statement brings together the foregoing comparisons in concise form:

Item.	Prices index number.	
	1908.	1909.
Best native steers, Chicago	136.4	139.9
Choice to extra steers, Chicago	126.3	....
All fresh beef sold in New York by large packing house	119.8	....
Native carcasses, common to fair, New York	129.7	133.6
Native sides, New York (another authority)	120.1	....
Beef carcasses, Chicago	123.7	....
Export price, fresh beef	118.5	120.9

CURED-BEEF PRICES.

There is no obtainable comparative cattle price at Chicago with which the index numbers for cured beef are strictly comparable. The class of cattle for which a comparative number is obtainable nearest to the classes that contribute the cured beef is the class of choice to extra steers already mentioned as being represented by 126.3 for 1908, and these numbers are higher than they would be if they represented the lower classes of cattle from which the cured beef is obtained.

The Bureau of Labor's mean wholesale prices for 1896–1900 being 100, the comparative price of extra mess salt beef for 1908 is 151.9; of western salt hams, 134; of tallow, 139.9. By the same process, with dependence on the reports of a commercial authority, salt family beef is 165 in 1908.

The general conclusion is warranted that cured beef has increased in price in greater degree than fresh beef has and greater than steers have.

The items for cured beef in the following table may be compared with steers and fresh beef in the preceding table:

Item.	Wholesale prices index number.	
	1908.	1909.
Extra mess beef, salt	151.9	....
Western salt hams (beef)	134.0	....
Tallow	139.9	....
Family beef, salt	165.0	154.8
Export price, salted or pickled beef	124.5	141.0
Export price, tallow	137.2	130.9

RETAIL PRICES OF BEEF.

The sole dependence for the series of mean retail prices of beef is the annual reports of the Bureau of Labor on this subject, ending with 1907. For 1908 and 1909 special investigation was made for this report.

Approximately the retail prices of fresh-beef roasts and steaks have increased relatively as the wholesale prices of fresh beef have, with a tendency of steaks to increase more than roasts.

Item.	Retail prices index number.	
	1908.	1909.
Beef, fresh:		
Roasts	122.0	132.2
Steaks	123.3	133.7

SUMMARY OF BEEF PRICES.

The prices of all commodities for 1908 are represented by 116.9 as compared with the price level of 1896–1900; for 1909 by 122.6. The general conclusion is that the relative increase of the prices of steers at Chicago and of wholesale and of retail fresh beef has been roughly the same, and considerably more than the combined prices of all commodities, while the farmer who has produced or matured beef has participated in the upward beef-price movement only through the corn that he has fed, and then not fully. His cattle, before corn feeding, stand where they did in the price level of 1896–1900, and the best of them for beef purposes have not gained much.

PORK PRICES.

INCREASE FOR HOGS AND CORN.

The situation with regard to hogs is more fair to the farmer than the cattle situation is, but still it is apparent that during the last three years the price of corn has been too high for the price of hogs.

Still continuing to represent the price level of 1896–1900 by 100, the hog may be followed from farm to consumer with regard to relative increase of prices. The reports of the Bureau of Statistics of the Department of Agriculture concerning the farm price of hogs January 1 each year give these animals a standing of 147.3 for 1909, or far below the position of corn in relative price, which was 212.6 for December 1, 1908. Many of these hogs at the time of January 1 are more or less unfinished, and yet exhibit the relative gain in price on the farm that they do when matured with 60-cent corn, as shown below.

SLAUGHTER COST OF HOGS.

The average cost per 100 pounds of all hogs slaughtered at principal markets is indicated by 148.1 in 1908, about the same as the increase in farm price; yet they do not fully return to the farmer the price of the corn fed to them. In Chicago prime hogs are represented by the relative number 160.9 for 1908, according to a commercial authority.

WHOLESALE CARCASS PRICES.

The relative gain of carcasses in price is approximately the same as that of live hogs at the great markets. Compared with the price level of 1896–1900, the price of dressed hogs of 160 pounds in New York in 1908 stands at 145.7, and the carcasses of market pigs at Chicago at 148.4. For 1909 the comparisons stand thus: Hogs on the farm, 147.3; prime hogs at Chicago, 202.3; dressed hogs of 160 pounds in New York, 168.9; carcasses of market pigs at Chicago, 180.5.

When observed in tabular form the foregoing numbers exhibit some rough agreements in the price movements of hogs on the farm, at great slaughtering points, and of carcasses at wholesale. There are differences and irregularities due to differences in the descriptions of the animals.

RETAIL PRICES OF PORK.

The latest year for which the Bureau of Labor's retail index number for fresh pork can be given is 1907 and it is 141.7, or perhaps near enough to the relative wholesale number to indicate approximate agreement in price movement.

Item.	Prices index number.		
	1907.	1908.	1909.
Hogs on the farm, January 1	171.3	136.0	147.1
Cost of all hogs bought at great slaughter points	139.3	148.1	....
Prime hogs, Chicago	139.4	160.9	202.3
Dressed hogs, 160 pounds, New York	158.3	145.7	168.9
Market pigs, carcasses, Chicago	139.1	148.4	180.5
Fresh pork, retail	141.7	....	....

PORK PRODUCTS.

The wholesale prices of most pork products have exceeded the price of hogs, carcasses, and fresh pork, in rate of advance, and all obtainable items with regard to them are assembled in the following table, wherein the facts stated plainly appear:

Item.	Wholesale prices index number.	
	1908.	1909.
Pork:		
Mess	152.7	204.6
New mess (another authority)	179.8	226.3
Salt, mess (another authority)	161.1	....
Bacon, short:		
Ribs, smoked, Chicago	170.5	221.0
Rib sides (another authority)	150.8	....
Do	152.0	200.0
Clear sides	151.9	....
Hams:		
Smoked	113.9	120.7
Smoked (another authority)	122.5	....
Lard:		
Western steam	177.0	223.7
Prime contract	167.7	....
Export prices:		
Bacon	142.9	142.9
Hams	114.6	112.6
Lard	149.2	168.9
Pork (salted or pickled)	149.8	148.1

SUMMARY OF MOVEMENT OF MEAT PRICES.

FARMER'S CATTLE HAVE BARELY ADVANCED.

Starting from the continuous shrinking of the cattle-range area, and more especially the removal of fences a few years ago from the ranges owned by the United States, and from the development of dry farming, which has converted range land into farms in regions of low rainfall, range cattle have been transferred from pasture to

'eed lot on farms in undue numbers. This increased the demand for 'orn and helped much to raise its price. The excessive marketing ›f cattle provided the largest exports of beef and its products in the iscal year 1906 that this country ever had. The depletion of the tock of breeding animals has gone so far that the people are now 'acing a much-reduced beef supply.

Coincident with the beef situation came the great fall in the prices ›f hogs late in 1907, when farmers sold breeding sows so as to diminsh a line of unprofitable production. This procedure restricted the ›ork production with results that are now felt.

In the upward movement of beef prices under the circumstances lescribed, the farmer has not shared equally with packer, wholesaler, ınd retail dealer. His raw cattle are barely as valuable as they were ıine to fourteen years ago, and, had not the price of corn ascended to ı high figure, perhaps he would not have shared in the least in ıigher beef prices. As it is, he is getting a share through feeding :orn, but not as much on this account as the price of corn demands.

With regard to hogs the case is different. The farmer has received ıearly his fair share of the higher prices of pork in the increased ›rice of his unfed hogs, and he gets some of his due in the corn used 'or feeding. The price of corn has been too high for the price of ›ork.

From the moment that the price is paid for the steer or hog in the tock yards to the purchase of the meat and its products by the conumer there are successive additions to price in slaughtering, in vholesaling, and in retailing. The adjustments of these three busiıess functions to one another with regard to their relative share in he final price have remained substantially the same since the period ›f 1896–1900, which constitutes the base line of this investigation. :f the retailer has increased his price of beef and pork, so has the vholesaler and the slaughterer, all with some show of approximation o the same degree as the price of the animal has advanced at the tock yards.

RISING PRICES OF FARM PRODUCTS.

COMPARISON WITH OTHER COMMODITIES.

FARMERS' GAIN IS RELATIVELY GREATER.

The increased cost of living within recent years permits an inquiry ıs to whether farm products have increased in price in greater degree :han other commodities have.

The comparison is preferable for the farm products for which farm ›rices are known as far back as the beginning of the present moveıent of advancing prices, which began in 1896. The method will be ›o take the mean price of 1896–1900 as the base on which the price of

each year will be relatively established, this base or mean of the five years mentioned being regarded as 100. Then if the price of a given commodity in a given year is above the mean for the five years its increase will be expressed as above 100, as, for example, by 102; if below, perhaps by 97 or some other number under 100. By this procedure the relative position of the price of wheat on the farm may be directly compared with the prices of other commodities.

In 1909 the relative price of all commodities, according to a commercial authority, is expressed by 122.6, the mean of 1896–1900 being regarded as 100. Only one year, 1906, reached a higher point since 1896, and that was indicated by 126.7.

Among the farm animals, horses exceeded the other kinds in relative increase of farm price, the index number being 264.4; next are mules, with 235.1; swine, with 147.3; and sheep, with 147.1. Cattle are below 122.6, the number for all commodities, milch cows being represented by 120.4 and other cattle by 100.8.

The weighted average for all live stock is 193.1.

All crops for which a farm value per bushel or other unit is known are above the relative increase of price of all commodities. The price of corn per bushel stands at 218.6 in 1909, compared with 100 for the mean of 1896–1900, and no other crop, as far as known, has risen as high, although oats reached 209.6.

Third in order are potatoes, with 192.4; then follow wheat, with 166.2; rye, 162.1; buckwheat, 161.9; tobacco, 161.4; barley, 147.3; cotton, 138.4; hay, 122.9.

All of the foregoing crops may be combined for an average, and this average, which has been weighted, is 180.9. For live stock the average, as previously mentioned, is 193.1. For the crops particularized and live stock combined the representative number is 186.9. This is an average that is weighted according to the values of the various crops and classes of animals. It has not been equaled during the price period under review beginning with 1896. Neither total animals nor total crops have equaled their relative price number for 1909. Animals nearly did so in 1907, for which year their relative number was 191.1, or only a little under the 193.1 of 1909. The average for all crops has at no time been nearer to the 180.9 of 1909 than 172.9 for 1908. In 1907 the relative price number for all crops was 166.7; in 1906 it was 134.6; in 1905 it was 135.6; in 1904 it was 136.9; in 1903 it was 142.2; in 1899 it was 103, and in 1896 it was 90.1, for which year the number representing all commodities was 87.1. Live stock had the representative number of 90.5 for 1896, and crops and live stock combined a weighted average of 90.3.

It is apparent that there has been a tendency of animals and crops of the farm to increase in value per unit at a faster rate than all commodities have increased.

FARM PRODUCTS AND FOODS IN WHOLESALE PRICES.

Some confirmation of this conclusion may be obtained by comparing the farm products with other commodities within the field of wholesale prices, that is, after these products have left the farm and have been more or less manufactured or prepared. The Bureau of Labor's investigations of wholesale prices afford materials, and the prices of 1896–1900 stand for 100; the latest year is 1908.

In that year the average for all commodities had the relative number 126.4, with which may be compared the number 141.9 for farm products, 128.7 for foods after they have left the farm, 121.9 for cloths and clothing, 125.3 for fuel and light, 124.9 for metals and implements, 132.8 for lumber and building materials, 106 for drugs and chemicals, and 119.5 for house-furnishing goods.

In wholesale trade, therefore, farm products exceed all other classes of commodities in relative increase of price since 1896, and food is exceeded only by farm products and by lumber and building materials.

The prices index numbers of a prominent commercial authority afford another opportunity within the field of wholesale prices to compare farm products and foods with other commodities, the latest year being 1909. All commodities have the relative price of 122.6, compared with 100 standing for the mean price of 1896-1900. Wheat, corn, oats, rye, and wheat flour are represented by comparative price numbers that are far above the 122.6 for all commodities, but barley, after being above for the two preceding years, has fallen to 110.2. Beeves stand at 139.9, hogs at 202.3, and horses at 228.8, while sheep are low at 110.7. Beef carcasses are at 122.6, or the average for all commodities, while pork and mutton carcasses and all meat products are far above.

Milk at New York is represented by 129.8, eggs by 205.1, creamery butter by 151.7, factory cheese by 145.3, salt mackerel by 108.2, and codfish by 153.1. Below the average are found coffee at 110.1, granulated sugar at 87.2, tea at 74.7, New Orleans molasses at 81.6, fine salt at 100.9, and rice at 100.6; but beans are represented at 163.4, peas by 146.8, potatoes by 152.2, and apples by 190.8. Ohio and Pennsylvania wool is placed at 137.3 in the scale of relative prices, or considerably above the general average of 122.6; native steer hides are at 167.9, and Burley tobacco at 177.5.

In the prices index numbers now under consideration the grouping of somewhat similar commodities into classes was not done before 1898, so that for the purpose that follows the mean of 1898–1900 is adopted as the base price level represented by 100. The number for all commodities then becomes 115.2. For the class of breadstuffs the representative number is 155.8; live stock, 165; provisions, 127.1; fruits, 90.1; hides and leather, 126.1; textiles and metals, each 107.7;

coal and coke, 107; oils, 122.5; naval stores, 104; building materials, 87.6; chemicals and drugs, 84.

The general fact is that in the upward movement of prices since 1896 the products of the farm have fared better than any other class of commodities, the only large item that is an exception being unfed beef cattle, the farm price of which has now barely begun to rise above the price level of 1896–1900 for beef cattle.

WORK OF THE DEPARTMENT IN 1909.

ENFORCEMENT OF THE FOOD AND DRUGS ACT.

The Food and Drugs Act locates in the Bureau of Chemistry the examination of specimens of foods and drugs for the purpose of determining whether such articles are misbranded or adulterated. In all other respects the law speaks to the Secretary of Agriculture, *who under the act is charged with its enforcement.* The advisory work is intrusted by the Secretary to the Board of Food and Drug Inspection and the Referee Board of Consulting Scientific Experts. The legal work is in the hands of the Solicitor of the Department of Agriculture.

CHEMICAL WORK.

Samples of suspected foods and drugs are collected in the course of interstate commerce by a force of inspectors connected with the Bureau of Chemistry, who also make sanitary inspections of factories. Samples of imported products are obtained through the agents of the Treasury Department.

The samples collected are first examined in the branch chemical laboratories, of which there are 21, situated at important ports of entry and commercial centers throughout the country, as follows: Boston, Buffalo, Chicago, Cincinnati, Denver, Detroit, Galveston, Honolulu, Kansas City, Nashville, New Orleans, New York, Omaha, Philadelphia, Pittsburg, Portland, Oreg., St. Louis, St. Paul, San Francisco, Savannah, and Seattle. At these laboratories, also, preliminary hearings are accorded the manufacturers and dealers concerned. When these examinations indicate that the product in question fails to comply with the law, the samples are forwarded to Washington, where another analysis is made in the Bureau of Chemistry, and opportunity for a full hearing before the Board of Food and Drug Inspection is accorded. When in any case the Board is satisfied that the law has been violated, the facts are reported to the Solicitor, who prepares the papers in the case for transmission to the Department of Justice, by whose officers the prosecution is conducted before the proper United States court.

Following this procedure about 1,300 factories were inspected during the year. About 15,000 samples of foods and drugs passing in interstate traffic were taken, of which 9,631 were submitted to examination in the branch laboratories, with the result that more than 2,000 were forwarded to Washington and reexamined in the Bureau of Chemistry. Of imported products the branch laboratories examined 8,476 samples, about 2,500 of which were sent to Washington for reexamination. In addition, more than 79,000 samples of imported goods were submitted to floor inspection at ports of entry, without examination in the laboratory. Preliminary hearings to the number of 6,901 were conducted at the branch laboratories.

ADVISORY WORK.

In the enforcement of the Food and Drugs Act this Department has to do with two classes of foods and drugs; first, those which enter interstate commerce or are sold or manufactured within the District of Columbia or the Territories, and, second, those offered for import into the United States at the various ports of entry.

After an examination of samples of suspected foods and drugs has been made by the Bureau of Chemistry the report of that Bureau is given to the Board of Food and Drug Inspection. If it appears to the Board that there has been a violation of the provisions of the food law, citations are issued to the person from whom the samples were purchased in order that he may appear and give evidence as to the facts in the case. As a matter of courtesy hearings are always granted every person who may have an interest in the case. Such hearings are always private.

The Board can not personally attend every hearing, except such as are held in the city of Washington. Hearings are granted at points where the branch laboratories of the Bureau of Chemistry are situated and are always held at such laboratories nearest and most convenient to the person cited. After the evidence has all been collected the cases are again considered by the Board, with the result that they are either dismissed, placed in permanent abeyance, or submitted to the Solicitor of the Department for the preparation of the cases in legal form. These cases then come to me for my final consideration as to whether or not they should be referred to the Department of Justice for prosecution.

Many of the questions which have come before the Board for consideration are exceedingly perplexing, and it has often been necessary to hold public hearings, at which anyone interested in the subject under discussion has an opportunity to appear and present such evidence as is deemed pertinent to the question. This plan has always been pursued by the Board in the consideration of large questions,

and in nearly every case, as the result of the hearings, formal decisions have been issued. Since the law was passed more than seventy food-inspection decisions have been issued for the guidance of those interested in the food law and the rulings under it. These decisions have no judicial force; they are merely statements of the Department's views and policy, and after their issuance it is customary to allow sufficient time to elapse before they are put into effect.

Under section 3 of the law the Secretary of the Treasury, the Secretary of Agriculture, and the Secretary of Commerce and Labor are empowered to make uniform rules and regulations for its enforcement. On October 16, 1906, what is known as Circular 21 of the Office of the Secretary was published. This contains the "rules and regulations" for the enforcement of the Food and Drugs Act. As experience has been gained in the enforcement of this law, necessity has arisen for adding to and amending the rules and regulations, and since the issuance of the first edition of Circular 21 ten rules and regulations have been promulgated by the three secretaries above mentioned. Some of these regulations are modifications of those already existing, while others deal with new subject-matter.

Attention might be called here to the public hearings which have been held, because they are important as showing the method of getting in touch with the manufacturers so as to have full information prior to the rendering of decisions. For example, the bleached flour hearing took five days for its completion, and the evidence given was very full. As a result of this hearing a decision on the subject was rendered by the Department. At the present time the matter is in the courts because of manufacturers who have not been willing to accept the views of the Department. It is expected that before long the question will be settled by the courts. Attention should be drawn also to the public hearing which was given on the labeling of mineral waters. This was very largely attended, and after mature consideration of the evidence submitted a decision was given expressing the opinion of the Department as to the proper labeling to be placed on beverages of this type. General hearings were given also on the subjects of the labeling of yeast, weights and measures, labeling of chocolate and cocoa, oysters, New Orleans molasses, alum, etc.

It has been my observation that the manufacturers and jobbers have appreciated the efforts of the Department to obtain full information before the issuance of decisions, and in general it may be said that practically no complaint has been received after the decisions have been issued, and they have been quite generally complied with. In this way the law has been administered without undue harshness, and yet the results which it is the object of the law to attain have been and are being obtained. It is not the desire of the Department to make this law an instrument of oppression, but rather

to get good results by the means indicated. In no case, so far as known, has the Department reported for prosecution cases against others than the persons who were originally responsible for the adulteration or misbranding; that is, it has been my desire to put the responsibility nowhere else. It is only by going to the fountain-head that the results can be obtained. No good can be obtained by prosecuting the middleman.

"Adulteration" is an ugly word in the popular mind. It carries with it the idea that there is grave danger to the public health when adulterated foods are consumed. This may or may not be true. Under section 7 of the Food and Drugs Act, adulterants are of two kinds, namely, (1) those which may be injurious to health, and (2) *those which are not unwholesome but which debase the character or* value of the food. Adulteration of the latter type wholly disappears when the foods are properly branded so that the consumer knows exactly what is being purchased. The question of the effect on health of "preservatives" in foods is in many instances very delicate. There is apparently but one way in which questions of this kind can be properly decided, and that is by means of experimental work. In some cases there appears to be a very marked difference of opinion among men who might be presumed to have the right to speak with authority on questions of this kind. The Department has therefore pursued the policy of submitting these large matters to what is called the "Referee Board of Consulting Scientific Experts," the personnel of which is such that the results obtained by them must of necessity carry conviction. This Board was first organized shortly after the pure-food law went into effect, and the members were chosen by ex-President Roosevelt after correspondence with the heads of a large number of the most prominent universities of the United States, and on his suggestion the men were appointed by me. The board at present consists of the following members: Ira Remsen, president of Johns Hopkins University; Russell H. Chittenden, director of the Sheffield Scientific School, Yale University; Alonzo E. Taylor, University of California; C. A. Herter, College of Physicians and Surgeons, New York; and John H. Long, Northwestern University, Chicago. Several of the larger questions have been referred to this Board, but as yet only one has been reported upon, namely, the effect upon health of sodium benzoate. This report is published by the Department as Report 88 and comprises 784 pages, in which all the details of three separate sets of feeding experiments are given. Clinical details are given and in fact all such data as were used in reaching the conclusions. This report describes probably the most extended experiment of its kind ever undertaken in any country. Based upon this report, the Secretary of the Treasury, the Secretary of Commerce and Labor, and myself, who are

empowered by the act to make rules and regulations for its enforcement, promulgated Food Inspection Decision 104, which states that benzoate of soda may be used in foods, provided the amount used is clearly stated upon the container or package of food containing this substance. To the Referee Board there has also been referred the effect of sulphur dioxid, of saccharin, and of sulphate of copper on health, the latter being the substance ordinarily used in the greening of vegetables, many of which are being offered for entry into the United States. This Board is now engaged in the work submitted to it, and it is expected that reports will be received shortly on some of the questions which are now in its hands for experimentation and investigation.

In accordance with the rules and regulations for the enforcement of the act, where cases have been sent to the courts and judicial opinions have been rendered, such opinions are published by the Department not less than thirty days after being given. Considerably more than one hundred of these court decisions under the name of "Notices of Judgment" have been issued by the Board of Food and Drug Inspection, and there are a number in the course of preparation. These notices of judgment appear to be carefully considered by the manufacturing interests. They contain the views of the courts on important points, and thus may serve as a guide, as in the case of the food inspection decisions.

The Department has carefully scrutinized the foods and drugs offered for entry at the various ports of the United States, with marked results. New York is the port at which perhaps 75 per cent of the foods and drugs are entered, and next in line comes Boston. There has been little difficulty in the enforcement of the law at the various ports on the whole. It may be said, however, that in some lines the entire character of products offered for entry has been changed, and products of a much higher grade are now imported. For example, it has been customary in the past for all case goods of edible oils, wines, liqueurs, distilled spirits, etc., to have marked on the outside not only the number of bottles or cans contained in the case, but also their contents. Examination has shown that such marking of contents has been very largely incorrect, but at the present time, through the work of the Department, very few, if any, fraudulent and misbranded cases are offered for entry. Olive oils are now offered at the ports of such a character that it is rare that one containing other oil is found.

Recently, importations of figs have been investigated. Information secured by the Department indicates that many of the packing houses in which figs have been packed in foreign countries are very insanitary and unhygienic, and that the products of these estab-

lishments constitute a distinct menace to the public health. In order to rectify these conditions no figs are now allowed entry into the United States unless accompanied by a certificate properly viséed by one of our American consuls, indicating the character of the conditions under which the packing has taken place. This does not of itself, however, secure immunity against inspection; on the contrary, figs which had been packed under sanitary conditions have been refused entry by the Secretary of the Treasury because of their wormy and moldy condition. As a result, the people of the United States are now receiving a clean and wholesome product, packed under proper conditions.

With the American people the term "cheese" has come to mean a product which is made from whole milk. A general inspection has been made at the various ports of the character of the cheeses offered for entry, and it has been found that a large number of the so-called cheeses have been made from milk from which a greater or less amount of the butter fat had been removed. The product made from such skim milk is properly called "skim-milk cheese," and all such cheeses offered for entry are now branded as "skim-milk cheeses," or in some way so as to indicate that skim milk has been used in their preparation.

It should not be understood, however, that cheese made from skim milk is unwholesome or lacking in food value. In fact, in the preparation of certain types of cheese, the removal of more or less of the fat from the milk is essential. It is, however, desirable for the consumer to know whether the cheese is made from whole milk, and this is accomplished by proper labeling.

The Federal food law has proved of value to some of our large cities in raising the quality of milk furnished. Watering and skimming of milk has been found altogether too common, nor is it unusual to encounter milk obtained under insanitary conditions and then improperly cared for. A number of milk crusades have been held and the results have been gratifying. These will be continued from time to time as conditions seem to warrant. Too much care can not be given to improving the standard of this most important of foodstuffs.

One of the most flagrant violations of the Food and Drugs Act was the shipment of coffee coated with a mineral poison—lead chromate. Eighty-four sacks of this coffee were seized and destroyed by order of the court. Criminal proceedings were brought against the shipper of this poisonous coffee and a fine was imposed.

Under section 7 of the law, confectionery containing mineral matter is considered adulterated. Action has been taken against the use of metallic silver as a coating for dragées, which are largely used as

a confection. The courts have sustained the Department and the case has been appealed by the defendants. Confectionery is a class of foodstuffs which must at all hazards be kept wholesome and pure.

Very few cases of the use of questionable preservatives are now encountered at the ports. Salicylic acid, boric acid, fluorides, and similar substances have practically disappeared from foodstuffs offered for entry, as well as foodstuffs manufactured within our borders and offered for interstate commerce. This result is especially gratifying because accomplished without recourse to the courts. It is true, however, that with respect to boric acid there are a few firms who have held out against the decision of the Department, but cases affecting them are now pending in the courts and it is expected that a judicial decision for our guidance will soon be given.

The correspondence of the Department relative to vexatious questions still indicates that the public is not yet fully informed concerning the law and its requirements. Wherever it is possible in the answering of the inquiries, information is given for the guidance of those making inquiry. It is not within the authority of the Department to point out exact methods of labeling, although as much information is given as can properly be extended.

Too great importance can not be attached to the character of the work done at the ports in controlling the drugs coming to this country. Very often the drugs are such that the Secretary of the Treasury, with whom I cooperate in the Board work for detentions, orders reexportation, as he has authority to do under section 11 of the Food and Drugs Act, where the products detained may be of such character as to prove dangerous to the health of the people of the United States. To illustrate: Certain Chinese pills are offered for entry as being remedial in cases of persons afflicted with the opium habit. Examination of these pills has shown that they contain material quantities of opium or morphine, and without doubt such products are of a fraudulent character and as remedial agents for the opium habit are absolutely dangerous. Crude drugs from which remedial agents are to be prepared have been rejected where the remedial agent prepared therefrom was not of a character capable of being standardized, and when the crude drugs are weaker than prescribed by the United States Pharmacopœia. As a result of this drastic but absolutely necessary action the character of the crude drugs offered for importation has been very materially improved, and exportation is not resorted to as frequently as formerly.

The character of the shipments of drugs is scrutinized, and when false or misleading statements are found the circulars are removed or destroyed.

At the beginning of the inspection at the ports it was found that too much time was consumed in the handling of import cases. This

difficulty has been overcome by the establishment of "precedents." It was found that there were many recurring cases of a similar type which the Department had to consider, and as soon as the line of action had become sufficiently settled I suggested to the Secretary of the Treasury that a similar line of action would be pursued by this Department when dealing with like cases. The Secretary of the Treasury has cooperated in such cases, and instead of the final action being taken in Washington they are now expedited by direct communication between the representatives of the Department of Agriculture and the Treasury at the ports of entry. This has very greatly minimized the time necessary to deal with certain classes of imports, and as conditions seem to warrant these precedents are increased in number so as to further expedite the work. This change has proved most satisfactory to the importers, but has in no way lessened the efficiency of the work.

LEGAL WORK.

There were reported through the Solicitor to the Attorney-General and United States attorneys 494 cases of violations of the Food and Drugs Act, 359 more than were so reported during the previous year. Eighty-five cases resulted in conviction and fines of $2,002, with costs of about equal amount; 98 cases resulted in decrees of condemnation and forfeiture of many tons of goods, both foods and drugs; only 2 cases were lost by the Government; 2 seizure cases are pending on appeal to the circuit court of appeals; 135 cases were dismissed; 53 civil, 74 criminal, and 42 seizure cases were pending in the courts at the close of the year. Many of the 135 cases dismissed were accompanied by mitigating or palliating circumstances which caused the Department to recommend their discontinuance.

Among the cases reported and successfully prosecuted during the year were upward of 75 cases involving the adulteration of milk and cream, shipped from outlying districts to St. Louis, Kansas City, Cincinnati, and Chicago. This crusade has resulted in the material purification of the milk supply of these cities. A number of the more pernicious nostrums, extensively advertised and sold as cures for cancer, diphtheria, skin diseases, headaches, etc., have been excluded by successful prosecutions from interstate commerce, and substantial progress has been made in the improvement of the quality of flavoring extracts.

The question of the constitutionality of the act was decided in the western district of Missouri, the court sustaining the validity of the act.

A writ of mandamus to compel the Secretary of Agriculture to withhold the recommendation of prosecutions against manufacturers and shippers of flour bleached by a certain process using nitrogen

peroxid was denied by the court, and the decision was approved by the court of appeals of the District of Columbia.

There were published during the year 66 notices of judgment, provided for by section 4 of the Food and Drugs Act. The demand for these notices is great, and it is apparent that manufacturers and dealers are closely watching the operation of the law.

OTHER LEGAL OPERATIONS OF THE DEPARTMENT.

The Department has continued, through the Office of the Solicitor, the enforcement of the Food and Drugs Act, the Meat-Inspection Law, the Twenty-eight-Hour Law, and such other laws and regulations as come properly under the jurisdiction of this Department. Prosecutions for violations are being vigorously carried out through the United States attorneys. This work has steadily increased, and the year ending June 30 last showed an increase over any previous year. The preliminary investigation and gathering of data necessary to perfect these cases for action in the courts have been carried on in the Office of the Solicitor, as well as the large volume of correspondence with United States attorneys relative to the maintenance of the cases in the courts. Briefs covering constitutionality, construction, and interpretation of the several laws committed to the Department for administration and enforcement have been written by the Solicitor at the request of the United States attorneys for use in contested cases, and almost daily advice and suggestions have been given United States attorneys in response to their requests for such assistance.

FOOD AND DRUGS ACT.

The legal work under this statute has already been discussed in connection with the chemical and advisory work necessary to its enforcement.

THE TWENTY-EIGHT-HOUR LAW.

In addition to 828 cases pending at the beginning of the year, there were 208 cases of violation of the Twenty-eight-Hour Law reported during the year, a decrease from the previous year of 477 cases, or 70 per cent. Penalties were collected amounting to $73,490 and costs $11,539.85, an increase over the previous year of $11,960 and $4,338.14, respectively. Of cases decided, only 33, or about 5 per cent, resulted adversely to the Government. The law has been vigorously enforced, and the decrease in the number of cases reported is gratifying evidence that the railroads are now complying in an appreciable measure with the requirements of the act.

The much-discussed question of what constitutes the unit of violation may be considered as finally settled, the decisions of several Circuit Courts of Appeals affirming the contention of the Department that each separate shipment constitutes an offense.

In practically all cases in which an interpretation of the meaning of the act was submitted to the courts the decisions have favored the contentions of the Government.

Bills have been introduced in two Congresses requiring the railroads to maintain a 16-mile rate on stock trains, but they have thus far failed of passage. It is believed that such a law would greatly facilitate the safe and humane transportation of animals in interstate commerce.

VIOLATION OF GAME LAWS.

Only one case was reported to the Attorney-General under the Lacey Act. It has been difficult to secure direct evidence sufficient to convict, but it is believed that under the law as amended to take effect in January next it will be possible materially to lessen the offenses now committed.

Four cases were consolidated against one person and resulted in the imposition of a fine of $400.

SUPPRESSION OF CONTAGIOUS DISEASES.

Nine cases of violations of the act for the suppression of contagious diseases among domestic animals were reported to the Attorney-General, and four remained unsettled at the end of the preceding year. One resulted in a fine of $100; eight were pending at the close of the year; two were dismissed; in one the grand jury failed to indict; and in one the defendant was discharged on preliminary hearing.

OFFENSES AGAINST THE QUARANTINE LAW.

Thirty-three cases of violations of the quarantine law were reported to the Attorney-General and five remained unsettled at the close of the previous year. Four cases resulted in fines of $300 in one, $100 in two, and in one $100 with a commitment to jail for thirty days; one resulted in acquittal; the grand jury failed to indict in three; one was withdrawn; and twenty-nine were pending at the close of the year.

The law is working admirably and has already accomplished beneficial results far in excess of the most sanguine expectations.

MEAT INSPECTION.

Only 44 cases of violations of the Meat Inspection Law were reported. These offenses are almost invariably committed by individuals and rarely by large establishments. There were fifteen convictions, seven dismissals for lack of evidence, and the rest were still pending at the close of the year.

CONTRACTS AND LEASES.

During the year 702 contracts and leases were prepared and examined, many of such a nature as to require unusual care and skill in their preparation.

NEED FOR FEDERAL INSPECTION OF INSECTS AND NURSERY STOCK.

In January, 1909, the authorities of the State of New York informed the Department that the brown-tail moth had been found in that State in shipments of seedlings received from Angers, France. Later it was learned also that the winter nests of this pernicious moth had been found in Ohio, on seedlings imported from the same French locality. By arrangement with the Treasury Department and the principal railroads, the Department was then promptly notified of the final destination of all cases of plants received, and was thus enabled to notify state inspectors or other competent persons near the destinations. Notices of nearly 800 shipments, divided among 35 States, were thus sent out. In 15 of these States nests of the brown-tail moth were found. Proper inspection was probably had in all cases, and it is likely that this concerted effort to prevent a new introduction of the brown-tail moth was for the time successful.

Under our present laws, however, these shipments might easily have been overlooked, and the considerable expenditures which for several years we have been making in the warfare against the brown-tail moth would then have been to no purpose. Moreover, unless additional legislation is secured, we are in constant danger of such introduction of pernicious insects from abroad. We can not depend upon the inspection systems of foreign countries. These may be rigid in one country and lax in another, or in any country there may come a period of laxity during which insect pests destined for this country may escape detection. Neither can we depend upon the law now on the federal statute books which prohibits transportation companies from "knowingly" bringing into this country, or carrying from State to State, any insect which is "notoriously injurious." Although this law also forbids the conveyance of "notoriously injurious" insects in the mails, it is nevertheless insufficient, and there is, besides, no provision for its enforcement.

What we need is a federal statute which shall not only forbid the importation or interstate transportation of injurious insects in all stages, with adequate penalties for its violation, but also provide for a thorough system of inspection and quarantine, at ports of entry, for nursery stock and other materials on which such insects may be imported, as well as a sufficient means of control of interstate transportation of such materials. Such an inspection, in conjunction with

the admirable systems now in existence in the States, would provide the country with a reasonable degree of protection against additional introductions of insect pests.

CHANGES IN THE PERSONNEL.

The total force of officers and employees on the rolls of the Department July 1, 1909, as shown by the report of the appointment clerk, numbered 11,140, a net increase of 720 during the fiscal year. The force employed in Washington numbered 2,317, and 8,823 were employed outside of Washington. During the year 24,494 appointments of every description were made. Of these, 16,938 were in the manual-labor grade, for temporary employment in the fields and forests and at stations outside of Washington, the appointments being for short periods, usually averaging three months. The number of persons receiving probationary appointments, equivalent to absolute appointment if retained in the service after the probationary period, was 1,492. There were reinstated 52, and transferred from other departments 61. During the year there were 511 resignations and 38 deaths, while 53 were separated from the service for misconduct. On July 1, 1909, there were 1,237 employees on the statutory roll (positions specifically provided for by the act of Congress making appropriations for the Department), and 9,903 were paid from lump-sum appropriations. The large number of emergency appointments is made necessary by the varied experiments, demonstrations, meat and food inspection, work on the National Forests, extinction of injurious insects, etc., where temporary help is required.

WEATHER BUREAU.

FORECASTS AND WARNINGS.

The scientific investigations of the Weather Bureau have been carried on successfully at the Mount Weather Research Observatory during the year. Additional knowledge of conditions in the upper atmosphere has been gained by means of kites and captive balloons, which have been sent into the upper air with instruments for recording the conditions of temperature, moisture, and winds at varying altitudes. The heights attained in these flights were greater than in the preceding year, but still greater altitudes are desirable in order to complete the needed series of observations.

These upper-air observations have been used with benefit in weather forecasting for the Atlantic Coast States, the atmospheric conditions at elevations of 8,000 to 10,000 feet having been found to bear definite relations to weather changes that subsequently occur at the surface of the earth in this region. For instance, it has been found

that the average wind direction at Mount Weather at about 10,000 feet above sea level is northwest, and that shifts of wind to west and southwest usually forerun by about two days the beginning of rain on the middle Atlantic seaboard. Continued observations will doubtless reveal other conditions a knowledge of which may prove of positive value in practical weather forecasting.

It is proposed to supplement the Mount Weather flights with others obtained through the liberation of free balloons during the coming year. On account of its proximity to the ocean, the research station will not be the scene of these flights; they will be made in the interior portion of the country, some of the balloons being liberated near a storm center and others sent up simultaneously some hundreds of miles to the eastward. Another line of experiments will be conducted at high stations in Nevada or Colorado, for the purpose of determining the changes in the atmosphere in a vertical direction.

Eight ascensions have so far been made, in each of which the altitude attained by the free balloon equaled or exceeded 10 miles. On October 12, at Omaha, Nebr., a height of 15 miles, hitherto unprecedented for this country, was attained, and on October 6, at Indianapolis, Ind., a height of nearly 14 miles was reached. The last-named ascension was made in almost the center of a great area of high pressure. The balloon was observed to move in a southwesterly direction at all altitudes, and was later found in that direction about 30 miles from the city. A similar movement—that is, a drift of the air at high altitudes toward the southwest—was observed at Omaha, Nebr. This would seem to indicate that the control of the general atmospheric movements exerted by areas of high pressure extends upward to greater altitudes than has hitherto been suspected.

In general, the results of the ascensions so far as available are in close accord with European observations. The great isothermal layer was reached on eight occasions; its lower limit varied greatly in altitude from day to day and for different surface weather conditions.

Measurements of the intensity of solar radiation and the polarization of sky light have been made at Mount Weather and at Washington during the year. Recent studies of this character have deepened the conviction that there is a relation between these manifestations of solar energy and weather conditions, and the Mount Weather Observatory is cooperating with foreign observatories in attempts to find out more definitely the nature of this relation. Magnetic observations have also been continued, and data of magnetic storms, auroras, and sun spots collected.

All of these observations have to do with securing a better knowledge of the conditions in the air far above the earth's surface, and the facts obtained are to be studied with a view to determining their relation to subsequent weather changes at or near the surface. The data

thus collected, as well as the discussions thereof, appear regularly in the Bulletin of the Mount Weather Observatory, a periodical publication almost wholly devoted to the meteorology of Mount Weather.

In addition to its daily forecasts, the Weather Bureau has issued forecasts for about a week in advance, as conditions warranted, from time to time. In practically every case these long-range predictions have met with a high degree of verification. On July 9, 1908, a forecast of a warm wave was issued some days in advance of its expected occurrence, and it was announced at the same time that it would be succeeded by much-needed rains in the Ohio Valley and Middle Atlantic States. The warm wave that followed was the most intense of the summer of 1908, and the rains came after as predicted. Similar forecasts of drought-relieving rains, tropical storms, frosts, and cold waves were followed by the conditions expected. These forecasts have been made possible through the additional information obtained from upper-air observations and by means of a system of observations covering the entire northern hemisphere.

KEY WEST HURRICANE.

In looking for single instances of important service rendered by the Weather Bureau the best illustrations will perhaps be found in its advance warnings of the destructive storms that from time to time visit the Atlantic and Gulf coasts. This generally accepted truth has received fresh confirmation in the history of the Key West hurricane of October 11, 1909. From the time this storm was first definitely located over the south-central Caribbean Sea, on the 6th, until it crossed the southern extremity of Florida and passed into the ocean, on the 11th and 12th, the Weather Bureau gave out daily advices regarding its intensity and the direction of its movement at every stage of its progress. The Bureau ordered storm warnings at the southern Florida coast stations on the 10th; at 6 a. m. of the 11th these were changed to hurricane warnings at Key West and Sand Key, and a special bulletin followed, giving a full account of the dangerous conditions then existing and describing the probable future course of the storm. Shipping in the affected area had already been warned to seek refuge.

Under orders from the Key West official the Weather Bureau men at Sand Key left their station for the light-house near by, where they continued observations during the storm. At the time the station was abandoned the wind was blowing at a rate of 75 miles an hour. An estimated velocity of 100 miles an hour was reached later, and at the height of the storm the island was covered with water. At 10.30 a. m. the Weather Bureau building was swept into the sea.

At Key West the barometer fell to 28.50 inches at 11.45 a. m., the lowest reading ever recorded at the station. Between 11 a. m. and

4 p. m. the wind velocity ranged from 68 to 76 miles an hour. During this time hundreds of buildings were blown down, many vessels were swept from their moorings, and some were wrecked, and at least six lives were lost. The total financial loss at Key West is estimated at $2,000,000 to $3,000,000.

After passing Key West the hurricane swept the Florida peninsula south of Miami. The damage between the two points is said to have aggregated millions of dollars, and 11 deaths are reported. Additional loss of life undoubtedly occurred among the fishermen and spongers and those dwelling on the low-lying islands or keys that fringe the coast of the southern Florida peninsula, since they were outside the zone of communication. Protective measures following the receipt of warnings reduced losses both of life and of property to a minimum, however, wherever the information could be given. The preparations made by the East Coast Railroad officials unquestionably saved hundreds of their employees from death. About 3,000 men were engaged on their construction works, but were withdrawn from their exposed position to places of safety upon receipt of the warnings. The vice-president of the line says:

> Positively not a life was lost in the storm. Very little damage was done to the right of way or to work on the extension. The road will be open to traffic within a few days to Knights Key. Warning by the Weather Bureau enabled us to fully protect all employees and equipment.

Three years before these same extension works were visited by a storm of less intensity than the one just experienced. Although warnings of its coming had been given, its arrival found the men unprepared; the high winds blew the boats in which they were quartered out to sea, and more than a hundred were drowned. As the recent storm was more severe than its predecessor, it is evident that the loss of life in this particular case would have been greater than it was three years ago had it not been for the protective measures that were taken as a result of the Bureau's warnings.

RIVER AND FLOOD SERVICE.

Great damage was done along the interior streams of central Kentucky in March, but with this exception there were no floods in the great rivers of the eastern and east-central portions of the country. At various times, however, floods occurred in the rivers of the Carolinas, Georgia, Alabama, Arkansas, Oklahoma, Kansas, Colorado, and California, the combined damage amounting to between $16,000,000 and $17,000,000. All of the flood stages were accurately forecast by the Weather Bureau. The losses reported were of an unavoidable character, while the value of the property saved as a result of advance warnings probably equaled the total amount of loss.

Two new river districts were established during the year, as follows:

1. Bismarck, N. Dak., with territory comprising that portion of the watershed of the Missouri River from Bismarck westward. This territory was formerly a part of the Sioux City, Iowa, district.

2. Wichita, Kans., with territory comprising that portion of the watershed of the Arkansas River from Wichita to the Kansas-Colorado line. This territory was formerly a part of the Fort Smith, Ark., district.

The study of the Ohio River has been continued during the year and the scheme of forecasting completed for that portion between Pittsburg and Louisville. The work on the lower river will probably be finished during the coming year and the scheme for the Mississippi begun.

Plans for the coming year will doubtless include increased observations in existing river districts and a cooperation with lines of work connected with the irrigation projects on the western streams.

MARINE WORK.

The Marine Division has continued its collection of observations from the oceans for use in the preparation of data for meteorological charts of the oceans. Data relative to fog prevalence along the northern route to Europe and on the banks of Newfoundland have also been prepared in the interest of navigation. This division has supervision of the wireless telegraph service conducted at points on the Pacific coast for obtaining and utilizing weather reports from the sea in the forecast work of the Bureau. It also has charge of the vessel-reporting service carried on by the Bureau for the benefit of maritime exchanges and the masters and owners of vessels.

WATER RESOURCES.

The study of snowfall conditions in the mountain regions has been furthered by the establishment of a large number of observing stations in the more inaccessible sections of the country. The Weather Bureau has cooperated in this work with other Government bureaus engaged in irrigation and reclamation projects. As the plans progress it is expected to complete a set of observations that will greatly increase the knowledge of the annual snowfall in those remote districts from which the western streams receive their water supply.

EVAPORATION STUDIES.

This work has continued at the evaporation stations on the Salton Sea and has been taken up at several of the western Reclamation Service projects and at stations of the water resources branch of the

Geological Survey in the territory east of the Mississippi. Information regarding evaporation is needed in connection with the engineering and reclamation work now being carried on in the arid districts of the West, and present arrangements provide for simultaneous measurements of evaporation in every type of climate.

NEW APPARATUS.

The demands for new apparatus have been met through the installation of booths for instrument display in the open squares of the larger cities; the construction of automatically recording river gauges; the perfecting of improved apparatus for measuring snowfall and for the registration of temperature and solar radiation, and instruments for the observation and study of evaporation. Some of these instruments have been perfected, while others are still in process of construction. The evaporation apparatus and snowfall collectors will be of special value in connection with the studies being made in the semiarid regions of the West and in obtaining reliable snowfall records in the high mountain regions of the country.

METEOROLOGICAL RECORDS.

A radical change in the methods of publication was introduced with the current year, the change having in view the presentation of meteorological data according to the natural divisions of the country, instead of by States as formerly. It is believed that the new method of publication will make the information more readily available than heretofore for the special use of any of the various enterprises or lines of development now being carried on throughout the country. The Monthly Weather Review has also been altered in character; in its new form it contains the tables of data prepared according to the new plan of publication and also a discussion of these data from the standpoint of the natural resources of the United States and their conservation, and it represents the mutual interests of the various branches of the Federal Government that are engaged in investigations of the country's resources.

BUREAU OF ANIMAL INDUSTRY.

The work of the Bureau of Animal Industry not only deals with the live-stock industry, but has an important bearing on the public health through the meat inspection, through efforts for the improvement of the milk supply, and through the investigation, prevention, and eradication of diseases which affect man as well as the lower animals. Indeed, the animal and the human phases of the Bureau's work are so closely related and interwoven that they could not be

separated without detriment to the efficiency of the service and without causing considerable duplication of work and expenditure.

In studying and eradicating animal diseases the work is often of indirect benefit to human health. In the meat inspection the knowledge required is primarily that of animal diseases and comparative pathology rather than of human medicine. While the wholesomeness of dairy products is of great importance to human health, the methods by which wholesome and sanitary dairy products are to be obtained are mainly questions for the veterinarian, the dairy bacteriologist, and the scientific dairyman.

There is great advantage and decided economy in having a specially trained and well-equipped central organization such as the Bureau of Animal Industry. Members of the force can be and are shifted as the needs of the service require. For instance, veterinarians engaged in field work in the eradication of animal diseases in the summer may be assigned to meat inspection in the winter, when the most slaughtering is done. The great value to the country of such an organization, with its staff of scientists and veterinarians, was strongly demonstrated during the recent outbreak of foot-and-mouth disease. Experienced and trained veterinarians to the number of 159 were temporarily withdrawn from the meat inspection and other branches of the service and assigned to the eradication of foot-and-mouth disease. New men were put in their places, and as these new men were assigned to work with and under experienced men the efficiency of the regular work was not impaired by the change. In this way not a day was lost in beginning effective work against foot-and-mouth disease after the discovery of the outbreak. Had any time been lost in getting together a force of competent men the contagion would have spread widely in the meantime and would undoubtedly have reached the great stock-growing regions of the West, where it would have caused tremendous damage and loss and where its eradication would have been exceedingly difficult and expensive, if not impossible. If the meat-inspection force had been under separate management it would have been impracticable to transfer the necessary men so promptly, even if this could have been arranged at all; and furthermore, men working on meat inspection alone would have lacked the varied experience and usefulness possessed by men trained in the broader work of the Bureau as at present organized.

Erroneous and misleading statements have been published to the effect that large sums are spent by the Department of Agriculture for the health of animals while practically nothing is spent for the protection of human health. It should be remembered that the Department's work through the Bureau of Animal Industry, besides including the study, prevention, and stamping out of animal diseases,

accomplishes much for the health of the people, especially through the meat inspection and the work for purer milk.

MEAT INSPECTION.

The meat inspection has continued to grow in magnitude until it has almost reached the maximum that can be carried on under the standing appropriation of $3,000,000 made by Congress, the expenditure for this work during the fiscal year having amounted to $2,884,000, an increase of about $165,000 over the previous year. The inspection was conducted during the past fiscal year at 876 establishments located in 240 cities and towns, an increase of 89 establishments and 29 cities and towns.

There were inspected before slaughter 56,545,737 animals, consisting of 7,588,144 cattle, 2,063,579 calves, 35,831,552 hogs, 10,992,579 sheep, and 69,883 goats. The animals inspected at and after slaughter numbered 55,672,075, of which 7,325,337 were cattle, 2,046,711 calves, 35,427,931 hogs, 10,802,903 sheep, and 69,193 goats. Of these, 141,085 carcasses and 899,628 parts of carcasses were condemned. Tuberculosis continues to be the cause of condemnation of the greater portion of the condemned cattle and hog carcasses, and over 99 per cent of the condemnations of parts of hog carcasses were due to this disease.

Nearly 7,000,000,000 pounds of meat food products were prepared and processed under the supervision of the government inspectors, and there were condemned on reinspection 24,679,754 pounds of meat products which had become sour, tainted, putrid, unclean, or, in the case of fats, rancid since inspection at slaughter. These latter condemnations show a decrease of 43 per cent from those of the previous year, indicating that the close supervision and strict sanitary requirements of the Department under the authority given by the new meat-inspection law have brought about great improvement in sanitary conditions and in the methods of handling meat products.

In justice alike to the public and to the members of the force, the Department makes it a practice to investigate thoroughly all charges that are sufficiently grave and specific to merit such attention. While absolute infallibility and perfection are not claimed and can not be expected, it is gratifying to be able to state that searching investigations at different times and places have revealed nothing that should impair public confidence in the service, but on the contrary have shown that with few very rare exceptions the members of the force are honest, competent, hard-working, and deserving of praise for their good work.

The Department maintains a constant and close surveillance over all its work of meat inspection. No less than seven traveling in-

spectors go about among the various stations, the times of their visits being unknown beforehand to the local employees. It would be exceedingly difficult for corruption or inefficiency to reach serious proportions or to exist very long without detection.

INSPECTION OF EXPORT ANIMALS.

The outbreak of foot-and-mouth disease caused a considerable reduction in exports of cattle and sheep. The Bureau of Animal Industry made during the fiscal year 397,925 inspections, including reinspections of 227,255 animals for export from the United States, besides inspecting 50,943 Canadian animals in transit through the United States for export. There were inspected on arrival at British ports, by Bureau inspectors stationed there, 259,297 animals from the United States and Canada. During the year 473 inspections of vessels carrying live stock were made in order to see that the fittings, equipment, ventilation, feed, water, attendants, etc., conformed to the regulations.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

In order to prevent the introduction of contagious diseases of live stock the Bureau makes a rigid inspection of all imported animals at ports of entry, and a quarantine is imposed upon animals from all parts of the world except North America. During the fiscal year 237,804 imported animals were inspected, 4,760 of which were also quarantined.

CONTROL AND ERADICATION OF CONTAGIOUS DISEASES OF LIVE STOCK.

FOOT-AND-MOUTH DISEASE.

The outbreak of contagious foot-and-mouth disease, referred to in my previous report, was stamped out after a vigorous campaign by this Department in cooperation with the authorities of the affected States. The disease was discovered in Pennsylvania early in November, 1908, and the territory affected comprised fifteen counties in Pennsylvania, five counties in New York, two counties in Michigan, and one county in Maryland. The plan of eradication followed was similar to that successfully employed six years previously in the New England outbreak, namely, to enforce a strict quarantine, to discover all infected animals and localities, and to slaughter and bury all diseased and exposed animals and disinfect the premises occupied by them. The condemned animals were appraised and the owners were paid the full appraised value, two-thirds by the Department and one-third by the State. The expenses of burial, disinfection, etc., were shared in the same way.

The total number of animals slaughtered was 3,636, and their total appraised value was $90,033.18. The figures by States are as follows: In Pennsylvania, 1,232 cattle, 1,000 hogs, 52 sheep, 4 goats; a total of 2,288 animals, valued at $58,667.22, on 101 premises. In New York, 520 cattle, 246 hogs, 214 sheep; a total of 980 animals, valued at $24,378.13, on 45 premises. In Michigan, 242 cattle, 23 hogs, 9 sheep, 3 goats; a total of 277 animals, valued at $5,359, on 9 premises. In Maryland, 31 cattle, 60 hogs; a total of 91 animals, valued at $1,628.83, on 2 premises.

The Bureau of Animal Industry had a force of 572 men, including 159 veterinarians, engaged in the work of inspection and eradication. In addition to the work of slaughter, burial, and disinfection, a vast amount of work was done in thoroughly canvassing the infected regions, going from farm to farm and inspecting all animals, and in investigating rumors of disease so as to detect all cases. The number of visits made by the Bureau's inspectors was 108,683, and the total number of animals inspected, including reinspections, was more than a million and a half. Besides the infected States the inspectors visited points in Ohio, Indiana, Kentucky, West Virginia, Virginia, New Jersey, Delaware, and Connecticut in tracing rumors.

The federal quarantine, which was first placed upon four counties in Pennsylvania, effective November 13, 1908, was extended from time to time as additional territory was found to be infected. With the progress of eradication the quarantine was modified and partly released from time to time, as conditions warranted, and was entirely removed April 24, 1909.

The amount expended by the Department of Agriculture in eradicating the disease was barely kept within the special appropriations, aggregating $300,000, made by Congress for that purpose. Fortunately the disease was confined to practically the territory infected at the time of its discovery and was prevented from spreading to other sections. If it had persisted longer or spread farther, it would have been necessary to call upon Congress for additional funds.

On tracing the origin of the disease, which was at first a matter of mystery, it was soon found that the cattle which carried it into Pennsylvania came through the Buffalo stock yards, and from Buffalo suspicion pointed to Michigan. I visited Buffalo and Detroit, in company with the Chief of the Bureau of Animal Industry, in order to give personal attention to the situation. It was believed from the first that the contagion must have come from abroad, yet in view of the Department's strict quarantine on imported live stock it was considered improbable that it could have been brought in with animals, and other means of entrance were looked for. When inspectors of the Bureau of Animal Industry traced the disease to certain calves that had been used by a Detroit firm for the propagation of smallpox

vaccine it was regarded as very probable that the vaccine was contaminated with the virus of foot-and-mouth disease and that the outbreak was due to this cause. I therefore directed that a careful scientific investigation be made to determine this point, and the work was intrusted to Dr. John R. Mohler, of the Bureau of Animal Industry, and Dr. Milton J. Rosenau, of the Public Health and Marine-Hospital Service, that Service having been invited to join in the investigation because it was charged by law with the supervision of biological products used in human medicine.

These investigators by a noteworthy piece of scientific work demonstrated that the smallpox vaccine virus of the Detroit firm was in fact contaminated with foot-and-mouth disease, and, further, that the vaccine of a Pennsylvania firm, from which the particular strain of vaccine in question was obtained by the Detroit firm, was likewise contaminated. While it is not positively known just how long the contamination had existed at the Pennsylvania establishment, it seems probable that it was introduced with vaccine virus imported from Japan in 1902, and that it was the cause of the New England outbreak of that year.

The introduction of the contagion through contaminated vaccine shows the importance of a congressional enactment giving to the Secretary of Agriculture power to control the importation of biological products intended for the treatment of animals, and to supervise the preparation of such products for interstate commerce, in the same manner that such products for use in human medicine are already under the control of the Public Health and Marine-Hospital Service. With the progress of medical and veterinary science there is an increasing traffic in vaccines, serums, antitoxins, etc., and there is great danger that without proper control there may be introduced with these remedies the contagion of some disease that would cause havoc among our live stock.

TICK ERADICATION.

Continued progress has been made in exterminating the ticks that spread the infection of Texas fever of cattle in the South. During the fiscal year areas aggregating 13,544 square miles were released from quarantine because of having been freed from the ticks, these areas being located in Virginia, North Carolina, Tennessee, Arkansas, Oklahoma, and California. Since the beginning of the work in 1906 there have been released 71,336 square miles. In connection with this work during the past fiscal year the inspectors of the Bureau of Animal Industry made over 3,000,000 inspections of cattle. The work of tick eradication is being carried on in cooperation with state authorities, and it is the Department's policy to operate only in States and localities where official and public sentiment are favorable. The amount expended by the Department for this work

in any State is dependent upon the amount that the state or local authorities are prepared to expend.

The tremendous benefits to be derived from this work become more evident as it progresses. In sections that have been freed from the ticks the farmers are obtaining higher prices for their cattle than can be realized for cattle from below the quarantine line, and they are also raising more and better cattle. At the leading markets to which southern cattle are shipped there is a difference ranging from $2.25 to $5 a head between the prices paid for tick-infested cattle and for cattle of similar grades from the tick-free areas, and more than 1,000,000 southern cattle from the quarantined area are sold annually at these markets, besides animals marketed locally in the South. Taking $3 a head as a conservative average difference, it appears that there is an annual loss of over $3,000,000 on southern cattle shipped to northern markets, not taking into account the losses from the lighter weight and poorer condition of the tick-infested animals or the difference in price on animals marketed in the South. This is only one item in a heavy account of losses chargeable to the tick and which can be entirely overcome by exterminating the pest. The enormous economic value of this work and the possibility of its success are beyond question. It is only a matter of adequate appropriations by the state and federal governments.

SCABIES OF SHEEP AND CATTLE.

The work of eradicating the diseases known as scabies of sheep and cattle, which has been in progress for several years in cooperation with the authorities of a number of Western States, has been continued with good results and the infected territory has been still further reduced. During the fiscal year the States of Kansas, Nebraska, Montana, North Dakota, and South Dakota were released from the quarantine on account of sheep scab, and areas aggregating over 60,000 square miles in North Dakota, Colorado, Oklahoma, Kansas, and New Mexico were released from the quarantine for scabies in cattle. Employees of the Bureau of Animal Industry made 59,762,512 inspections of sheep and 17,656,934 inspections of cattle, and supervised 15,597,823 dippings of sheep and 1,559,477 dippings of cattle. Since the close of the fiscal year it has been found necessary to place a federal quarantine on the State of Kentucky because of the increasing prevalence of sheep scab. Heretofore the quarantine for this disease has been confined to the West, and this is the first time that it has been considered necessary to impose a quarantine east of the Mississippi River.

TUBERCULOSIS.

Under the provision of the appropriation act for the past fiscal year "to enable the Secretary of Agriculture to investigate the prev-

alence and extent of tuberculosis among dairy cattle in the United States," the tuberculin test was applied to numbers of cattle in several parts of the country by arrangement with state and local authorities. Cattle were tested for interstate shipment to States requiring the tuberculin test as a prerequisite to the admission of dairy and breeding cattle, and assistance was also given to city authorities in testing cows which furnished milk to certain cities. In all, 8,809 cattle were tested, of which 744, or 8.45 per cent, reacted as tuberculous. The proportion of tuberculous cows among those tested which supplied milk to cities was about 13 per cent.

The Bureau of Animal Industry has also endeavored to assist state live-stock sanitary officers in locating centers of tuberculous infection by reporting to these authorities the names and addresses of owners and feeders of cattle and hogs found tuberculous in the meat inspection, and such reports were made to authorities of twenty-eight States during the fiscal year.

Both of these lines of work should be and will be continued, so as to collect information as to the condition of a larger number of animals in a greater number of localities; but it is evident that tuberculosis prevails to an alarming degree, especially among milk cows, and that more aggressive measures should be taken by public authorities to check and stamp out the disease. To undertake the eradication of tuberculosis from the entire country would be a tremendous task, which would require the expenditure of an immense sum of money. As a preliminary measure it would probably be better to make a demonstration of what can be done in a small way by confining the work to certain localities. It might be well to establish small quarantined areas where the disease is found to be unusually prevalent and to allow cattle and hogs to be shipped out for slaughter only when tagged for identification. Animals found diseased when slaughtered should then be reported back and steps taken to control or eradicate the disease on the particular farms where they originated. Cattle shipped from such quarantined areas for purposes other than slaughter should be required first to pass the tuberculin test. By some such method the disease could doubtless be gradually reduced and finally stamped out in the areas referred to, and the work could be gradually extended.

HOG CHOLERA.

The Department has continued its efforts to interest state authorities in undertaking the preparation of serum according to the method of Dr. M. Dorset, of the Bureau of Animal Industry, for the prevention of hog cholera, as the manufacture of the serum for the use of hog raisers throughout the country is too great a task for the Department to assume. During the year representatives of fifteen States at the

invitation of the Department visited the experimental farm of the Bureau near Ames, Iowa, where they conferred with representatives of the Bureau, and had opportunity to observe and study the methods used. As a result of these conferences and others held during the preceding year at least twenty States have taken up the preparation of the serum to a greater or less extent. The plan is for each State to make provision for the manufacture of the serum for distribution among its citizens on such terms as may be considered proper. Considerable serum has been prepared by state representatives, and 25,000 hogs have been treated with serum from these sources. The results have been so satisfactory that it is expected that the state work will be enlarged where it has already been undertaken and inaugurated in other States where hog raising is an important industry.

RABIES.

Judging by the increasing number of animals sent to the Bureau in order that diagnoses may be made as to whether or not they are affected with rabies, this dangerous disease appears to persist and even to have increased in prevalence during the year, especially in the vicinity of Washington, D. C. Out of 153 animals suspected of being affected and sent in for examination, 104 were found to be rabid, and these had bitten no less than 48 persons, besides a much larger number of animals. As the persons bitten were promptly notified of the diagnosis so that they might take preventive treatment, no deaths of persons are known to have resulted, but considerable anxiety and expense have nevertheless been caused to them and their families. Experience has shown that the strict enforcement of muzzling all dogs for a sufficient period is the most effective means of stamping out the disease, and no improvement may be expected until proper measures are vigorously applied.

NECROBACILLOSIS IN SHEEP.

During the year lip-and-leg ulceration and other forms of an infectious disease of sheep known as necrobacillosis have become quite prevalent in Wyoming and Montana, and the Bureau of Animal Industry has investigated the nature and extent of the disease with a view to combating it. This disease has existed in a mild form for many years and only recently has assumed a virulent form and seriously threatened the sheep industry. Certain portions of Wyoming were found to be so badly infected that soon after the close of the fiscal year they were placed under federal quarantine and shipments of sheep therefrom are permitted only under certain restrictions. Treatment is effective if carefully and thoroughly applied, and it is

hoped that by the combined means of treatment and quarantine the infection may be checked and stamped out without spreading to other parts of the country.

BLACKLEG VACCINE, TUBERCULIN, AND MALLEIN.

The preparation and distribution of vaccine for the prevention of blackleg in young cattle, which has been carried on by the Bureau for several years with the result of greatly reducing the losses from this disease, have been continued, about 1,150,000 doses having been sent out to stock owners free of charge during the year.

There were supplied to official veterinarians and health officers during the year over 250,000 doses of tuberculin for the diagnosis of tuberculosis in cattle, and more than 55,000 doses of mallein for the diagnosis of glanders in horses.

TUBERCULOSIS INVESTIGATIONS.

The scientists of the Bureau of Animal Industry have continued their studies of tuberculosis. An investigation of this disease as it simultaneously affected hogs and poultry on an Oregon ranch demonstrated that the transmission of tuberculosis from fowls to swine readily occurs. During the year an article by an American investigator pronouncing tuberculosis in all its forms to be a bacteriemia—indicating that the disease was constantly associated with the presence of numerous tubercle bacilli in the blood—led the Bureau to carry out a series of experiments on this point, which had an important bearing on the meat-inspection regulations; and as a result of these experiments it was shown that while in some forms of the disease the bacilli may in rare instances be present in the blood for short periods of time, tuberculosis, at least in animals, is not characterized by the condition referred to and can not properly be termed a bacteriemia. Experiments made by the Bureau during the year with reference to the sources from which hogs contract tuberculosis indicate that infection occurs much more readily from allowing hogs to feed on the feces of tuberculous cattle than from exposing them to tuberculous hogs or feeding them the milk of tuberculous cows, although the latter is also a common mode of infection. Tests of the duration of life of tubercle bacilli in butter and cheese are still in progress, as are also various investigations in the immunization of cattle against tuberculosis.

INVESTIGATION OF OTHER DISEASES AND CONDITIONS.

The work on infectious anemia or swamp fever of horses, epizootic lymphangitis of horses, and chronic bacterial dysentery of cattle have been continued, and publications giving information as to these

diseases have been issued or prepared. The work of the past year on infectious anemia has been mainly directed to developing a method of producing artificial immunity, and the results so far obtained give promise of success.

Experiments with a view to ridding sheep of roundworms have been continued, and it has been shown that the degree of infection in lambs can be reduced by changing the flock at intervals to fresh pasture, and that by keeping lambs and ewes separated under certain conditions the lambs can be entirely protected from infection. This work is of considerable practical value to sheep raisers in regions where losses from parasitic infection are heavy.

Investigations have also been made or are in progress concerning anthrax, infectious ophthalmia in cattle, pseudo-leukemia in hogs, injury to live stock by feeding cotton-seed meal, milk sickness in Tennessee, "sandburn" in Texas, and other diseases and conditions, including diseases of poultry and other birds.

TESTS OF SERUMS, ETC.

Under authority of Congress tests have been made of tuberculin, serums, and analogous products sold for the detection, prevention, treatment, or cure of diseases of domestic animals. Two imported preparations advertised and labeled, respectively, as a serum and a vaccine against hog cholera were found to be ineffective for protecting hogs against that disease. A domestic preparation widely advertised as an "antiabortion serum" was found not to be a serum at all, but to consist of a weak solution of carbolic acid. The tuberculins tested during the year were all found to be satisfactory. Several so-called "rat viruses" were also tested, but none were found to contain germs that were reliable agents for killing rats or spreading disease among them.

ANIMAL HUSBANDRY.

BREEDING AND FEEDING.

The Bureau's investigations in animal breeding and feeding have progressed satisfactorily. Carriage horses are being bred in Colorado, Morgan horses in Vermont, Shire and Clydesdale horses in Iowa, range sheep in Wyoming, and milking Shorthorn and Holstein cattle in Minnesota. The experiments in animal nutrition at State College, Pa., and those in beef production in the South have been continued along the same lines as during the previous year and are yielding satisfactory results. In the breeding experiments at the Bureau's experiment station at Bethesda, Md., six zebra-ass hybrids were foaled during the year, three of which died, while the remaining three are vigorous and promising. Extensive experiments involv-

ing the use of nearly 4,000 small mammals, to determine certain points regarding inbreeding, heredity, etc., are under way at the station.

CLASSIFICATION FOR AMERICAN CARRIAGE HORSES.

The classification for American carriage horses proposed by the Department, in conjunction with certain breeders' associations, was used at twelve state fairs in 1908, and resulted in some good exhibits. Fourteen fairs of state or national importance offered the classification in 1909. This classification is expected to be of great value to farmers and horse breeders in the development and production of a good type of carriage horses.

POULTRY AND EGG INVESTIGATIONS.

Besides the cooperative experiments in poultry breeding and feeding at the Maine Agricultural Experiment Station, the Bureau has in progress some independent investigations, which are nearing completion, for the comparison of different methods of feeding poultry.

During the year a study was made of the conditions surrounding the production and marketing of eggs, and a report was published pointing out the heavy losses and the means by which they might be overcome. A cold-storage evaporimeter, for measuring and regulating moisture in storage rooms, was devised by a member of the Bureau staff and has been patented by the Department so that it may be used by the public in this country free of royalty.

WORK RELATING TO THE DAIRY INDUSTRY.

SOUTHERN DAIRYING.

The educational work for the development and improvement of the dairy industry in the South has been continued along the same lines as in the previous fiscal year. Records have been kept of 73 herds containing 1,642 cows, enabling the owners to know just what results were being obtained from each cow and to eliminate unprofitable animals. Many of these owners have been induced to use purebred bulls for the improvement of their herds. Assistance has been given in the improvement of the milk supplies of 20 southern cities. Plans have been furnished and advice given for the construction of barns, stables, dairy houses, silos, etc. Agents of the Bureau have spoken at numerous meetings, have given instruction in schools, and have given advice and assistance to individual dairymen and farmers. The organization of dairy associations has been encouraged. The policy is to work in cooperation with state authorities and through institutions and associations so far as possible, and to turn the work over to these bodies gradually as they are prepared to take it up and carry it on. Several States have provided men and

appropriations for such work. The work so far done is proving of great practical benefit. The South has great possibilities for a prosperous dairy industry, but there is need of development of resources and improvement in quality of animals and in methods.

COW-TEST ASSOCIATIONS.

Assistance has been given to state officials in organizing and conducting associations for the purpose of keeping records of dairy herds and cooperating for the mutual advantage and improvement of the members. There are now 27 of these associations organized, with 741 members, owning 11,686 cows, in 9 States.

DAIRY PRODUCTS INVESTIGATIONS.

Investigations and experiments have been carried on to determine various problems with regard to the manufacture of butter and cheese, and the bacteriology and composition of milk. The study of factors influencing undesirable changes in storage butter has yielded important practical results. It has been found that acid in cream causes great changes in the flavor of such butter, and that the troublesome "fishy flavor" occurs only in highly acid butter and sometimes only when it has been overworked. It has been determined that butter with excellent keeping quality can be made of pasteurized sweet cream without the use of a "starter," and this seems to be a remedy for some of the conditions that have caused loss to the butter trade.

Work on the Cheddar, Swiss, Camembert, and Roquefort types of cheese has been continued, and information of practical value to the cheese industry is being developed. A special study has been made of the difficulties encountered in the manufacture of the Camembert type of cheese in the United States. It appears that climatic conditions are unfavorable during the greater part of the year in most of the regions where factories have been located, but that this disadvantage can be overcome by constructing factories in such a manner as to provide proper control of temperature, humidity, and ventilation.

A study of commercially pasteurized milk has shown that in this process the lactic-acid bacteria are not entirely destroyed, and that they continue to check the development of harmful bacteria.

DAIRY MANUFACTURES.

The inspection of butter as received at three of the principal markets has been continued with benefit to the trade. The inspection is made at the request of the dealer or producer, and the defects in the butter are pointed out in a letter sent to the producer with suggestions for overcoming them.

The Bureau has rendered assistance to 159 creameries with a view to remedying difficulties and losses, and it is estimated that in consequence about $250,000 was saved to them during the past year.

IMPROVEMENT OF MILK SUPPLIES.

The Bureau of Animal Industry has carried on an important line of work for the improvement of the milk supplies of various cities. Representatives have been sent on request of local authorities to cooperate with them. Public meetings are often arranged for producers, consumers, physicians, and others, at which addresses are made and the subject of milk improvement is discussed, and sometimes there are competitive exhibitions of milk and cream. The score-card system of inspection is an effective means of improving the sanitary condition of dairies, and the Bureau recommends the use of this system and gives assistance in introducing and applying it. During the year the score-card system was adopted in 64 cities, making the total number now using it 125. Bureau representatives visited 315 dairy farms, located in 18 States, during the year, for the purpose of assisting local inspectors in the use of the score card, and the average score on these farms was 46.42 points on a scale of 100. Reports received on 29,970 dairies show an average score of 52. As a rule the scores are entirely too low, but marked improvement usually follows the inauguration of dairy inspection by the score-card system.

RENOVATED-BUTTER INSPECTION.

The Department is charged by law with the supervision of factories producing renovated or process butter and with the inspection of the materials used and the product turned out. Inspection was carried on at 43 factories during the year, and the product amounted to 47,432,276 pounds, a slight decrease as compared with the previous year.

OTHER DAIRY WORK.

A very practical and helpful feature of the Bureau's work is the designing of various kinds of buildings and the furnishing of drawings and specifications for their construction. During the past fiscal year 2,086 blueprints were sent out.

Experiments in stable ventilation have been in progress for the past two years, to test the efficiency of methods already in use and to improve upon them if possible. The results indicate that certain hitherto accepted principles of ventilation are wrong, and it is believed that this work will be the means of improvement.

BUREAU OF PLANT INDUSTRY.

A rapidly growing interest is being shown in this country in what may be termed agricultural readjustment. The shifting and changing of economic conditions due to world-wide influences and the almost complete reversion of old and established agricultural practices and methods due to purely local causes all tend to make the study of crop production and crop adaptation more and more complicated each year.

WORK FOR THE DRY-LAND FARMER.

A striking example of the trend of agricultural development and effort at readjustment is found in the widespread demand for help coming from all that vast territory west of the one hundredth meridian and popularly spoken of as the dry-farming area or the Great Plains region. The nation, the States, and private interests are doing much to attract settlers to this territory, especially to the irrigated portions of it, and in consequence the demand for knowledge on the part of settlers is greater at present than can be supplied.

With a view to aiding those who are seeking to make homes in this region, a number of lines of work have been inaugurated, the more important of which may be briefly reviewed.

Experiments to determine basic facts.—To secure knowledge on certain fundamental subjects, investigations have been in progress in the Great Plains area under the supervision of the Office of Dry-Land Agriculture since the spring of 1906. Experimental work is now under way at thirteen stations, located as follows: Judith Basin and Huntley, Mont.; Williston, Dickinson, and Edgeley, N. Dak.; Bellefourche, S. Dak.; North Platte and Scottsbluff, Nebr.; Akron, Colo.; Hays and Garden City, Kans.; and Amarillo and Dalhart, Tex. The work at all these stations is identical. Cropping systems, including continuous cropping with a single crop (such as wheat, corn, oats, or barley), alternate cropping and summer tillage with these same crops, and many crop rotations of two, three, four, five, and six years have been established. Crop sequence, green manuring with both legumes and grasses, time of plowing, depth of plowing, effects of tillage both before and after seeding, and, in short, practically all the various combinations of crop sequence and tillage methods suggested or practiced in this region for the conservation of moisture are being carefully studied.

Work on the reclamation projects.—Closely affiliated with the foregoing work is that undertaken in cooperation with the Reclamation Service and at the request of the officers of that Service. The Reclamation Service is proceeding with the development of its irrigation projects, and as these are being completed the necessity

for advice and assistance along agricultural lines becomes more and more evident. The cooperation undertaken by the Bureau of Plant Industry involves close relations with the experiment stations in the States in which the projects are located. The new regions have peculiar and often unusual agricultural conditions and present problems that are complicated on account of the special crops grown and the limited number of workers at hand.

Field stations have been established on the projects proper. Through these field stations the investigators of the Department are able to be of direct assistance to new settlers by putting the results of their investigations into practice where such results can be seen and appreciated. The work therefore partakes in part of experiments, in part of tests of various crops, and to a certain extent of direct demonstrations. The demonstration work can not as yet be very rapidly pushed, owing to lack of knowledge regarding the character of the crops that can be grown and how they should be grown. This work is now in progress at Yuma, Ariz.; Fallon, Nev.; Klamath and Umatilla, Oreg.; Huntley, Mont.; and Bellefourche, S. Dak.

FORAGE CROPS FOR THE DRY SECTIONS.—The forage-crop problems for the dry sections fall within four principal lines: (1) A thorough testing of the most promising crops at hand; (2) new methods of culture for alfalfa and perennial grasses, so that they can be grown with less rainfall; (3) the search for new drought and cold resistant forage crops; and (4) the breeding of new crops for all this section.

In the testing of promising forage crops very encouraging results have been secured in the northern half of the Great Plains region with Canadian field peas. It is necessary to grow this crop alone, as the moisture is not sufficient to support the plants with a mixture of small grains. This crop has succeeded well on all the dry-land farms as far south as Amarillo, Tex.

Another important crop for the dry section is Siberian millet, introduced by the Department in 1899. This plant is proving valuable, on account of its great resistance to drought and its short season. Elaborate tests are being made with the sorghums as a dry-land crop. These plants are found to have great resistance to drought, and the quantity and quality of roughage produced per acre and the sureness of the crop make it of great importance, especially where dependence is placed on stock farming. A special feature is being made of alfalfa culture for this entire section. When broadcasted even the most drought-resistant varieties of alfalfa require about 15 inches of rainfall in Dakota, 18 inches in Nebraska, and 20 inches in Texas. When cultivated in rows, however, the crop succeeds under more arid conditions.

The cold and drought resistant alfalfas which were referred to in my last report as having been obtained in Siberia are still under test, and it is hoped that out of them, by breeding and otherwise, there may be secured some strains of great value to the northwestern sections of the United States. Cultural methods as affecting the growth of forage crops in this dry region have received considerable attention. The methods of growing alfalfa in rows have already been referred to. Similar methods have been applied to growing certain grasses, with good results. In portions of the drier regions of Texas very promising results have been secured from alfalfa growing, using the crop as a pasture for hogs. It has been found that where the alfalfa is pastured growth is more abundant, owing doubtless to the much smaller evaporation of water. The evidence at hand seems to indicate that when alfalfa is pastured in these drier regions it far outyields the crop grown in the ordinary way. Breeding to secure drought and cold resistant crops for this region is being pushed vigorously. Promising results in breeding alfalfa, millet, and certain types of sorghums have already been secured.

Durum wheat.—The annual production of durum wheat at present, though difficult to determine before taking a census, appears to be at least 50 million bushels, and probably comes nearer to 60 million. The important fact, however, is that a rough estimate shows that *nearly two-thirds of this production is in districts so dry ordinarily* that other wheats can not be successfully grown, thus having made it possible during the past year to add materially to our wheat crop during the time of scarcity and high prices. Recently two additional interesting facts have developed: (1) The great interest taken by several of the largest mills in the country in the manufacture of patent flour from durum wheat. One of these, a Minneapolis firm, now employs a mill of high capacity exclusively on durum wheat. (2) The rapid increase in the use by foreign countries of our export durum wheat for bread flour. The export now averages considerably over 20 million bushels per annum, of which nearly or quite one-half goes to central and northern Europe, where it is used chiefly for bread.

Recently there has been an extension of the durum-wheat area into the western portions of the Great Plains and Intermountain districts. A number of new mills have been added to the list of those that grind the wheat, some of which are using it exclusively. Examinations of a number of samples received from different parts of the country show that recent reports of the deterioration of the wheat are unfounded, but have been caused by the fact that much of the grain shipped east was produced in humid areas not adapted to durum wheat and often mixed with other lots of better quality. American

millers need to become more familiar with the quality required in wheat of this class.

DRY-LAND CEREALS.—Durum wheat has now made its place as a semidry-land crop in the middle Great Plains region and is being rapidly extended into the intermountain dry-land districts. During the past year the work with dry-land cereals has been extended so that at the present time a comprehensive series of experiments is under way at Amarillo and Dalhart, Tex.; Akron, Colo.; Bellefourche and Highmore, S. Dak.; Williston and Dickinson, N. Dak.; Judith Basin, Mont.; Nephi, Utah; and Moro, Oreg. The experimental work at each station is under the charge of men specially qualified along the lines of grain improvement and familiar with the territory in which the station is located. Although these experiments in their present form have been running but three years, and some of them for even a shorter period, the results thus far obtained in determining suitable varieties for each locality and the best dates and rates of seeding have proved of great assistance to old and new settlers in all the dry country. It is found that many of the farmers in this region who are planting cereals grow mixed varieties. This alone has probably as much to do with the low average yield per acre in the United States as any other factor. One of the objects of the work in question is to enable farmers to obtain pure seed of drought-resistant kinds of wheats adapted to particular districts.

A very important line of investigation and study has for its object the development of hardy winter varieties of grain crops. During the past year winter wheat was grown at Williston, N. Dak., for the first time, the yield being nearly 40 bushels per acre. At Bellefourche, S. Dak., winter wheat has matured two years in succession, and the yields have been highly satisfactory—usually from 20 to 50 per cent higher than those of the best spring varieties. Extensive tests in the matter of time of seeding winter wheats have brought out the fact more forcibly than ever that the earlier the seed is planted after the 15th of August, provided moisture conditions are at all favorable, the greater will be the percentage of survival.

TREE CROPS IN DRY FARMING.—In portions of the Old World, namely, northern Africa and the southern portion of Asia, where rainfall is deficient and agriculture has been practiced for thousands of years, great dependence is placed on tree crops. In these older countries the fact has been clearly brought out that deep or wide rooted trees are able to stand drought much better than shallow-rooted annual crops. It must be remembered that trees produce not only fruits and nuts, but also rough and concentrated stock food, oils, drugs, and various other industrial products. One of the most striking examples of dry-land agriculture which has yet been brought into

prominence is olive growing in the semiarid regions of northern Africa. Here are found vast orchards of olive trees producing good crops year after year in regions where the rainfall often falls below 10 inches for years at a stretch. The system of culture in use there dates back to times of antiquity, when this part of Africa was controlled by the Romans.

With a view to introducing similar industries into the southwestern portion of this country, special studies have been conducted on the behavior of olive orchards in our own dry region where either through the failure of irrigation systems or for some other reason the trees have been deprived of their usual water supply. It has been found that the olive is remarkably resistant to drought, and while other fruit trees have died it has remained alive and borne crops of fruit under very trying conditions. Other important tree crops, such as the date, have been introduced, and studies are under way to determine what can be accomplished in securing trees which will produce stock food and other products useful to the farmer.

STUDIES OF SUCCESSFUL FARMS IN DRY REGIONS.—By seeking out individuals who have been farming for a series of years and by gathering up their experiences, a good deal has been learned about the proportion of years in which there have been crop failures and about the crops which are most reliable under the semiarid conditions prevailing. This work is being carried on by the Office of Farm Management and is being correlated so far as practicable with other lines of study in the Department, especially the reconnoissance soil surveys being conducted by the Bureau of Soils.

From time to time farmers are found who have been living in the dry belt from ten to twenty years and have developed for themselves a successful system of agriculture. A study of these systems, together with the methods of handling the soil, will, it is believed, put the Department in possession of information which will be very useful to settlers, who must have some immediate information to help them in their work.

PROGRESS IN PLANT AND SEED INTRODUCTION.

The several new types of cold and drought resistant alfalfas and other forage crops secured by Prof. N. E. Hansen and referred to in my last report are under test at a number of stations.

Of the new things recently brought from China, our experts are watching with particular interest the behavior of the wild peach, employed extensively in China as a grafting stock in dry sections for the apricot, peach, and almond, and possibly for the cherry and plum. A stock of this kind would be very valuable in the southwestern dry portions of the country, and the remarkable growth of this peach in these regions has already attracted considerable attention.

Among other new introductions a seedless, nonastringent persimmon has made promising growth at various places throughout the South; also a large-fruited, dry-land Chinese date, which has been grafted successfully and seems to promise a new dried-fruit industry.

The Chinese pistache tree is another introduction which is not only promising as a shade tree for the Southwest, but is the hardiest of all pistaches and a promising stock for the important pistache nut of commerce. Large quantities of this pistache nut are now imported, and it is hoped eventually to have this industry taken care of in our own country.

So great has been the demand for new plants and new crops, especially for the cold northwestern portions of the country, that Mr. Frank N. Meyer, who returned a year ago from a three years' exploration trip through portions of Asia, has again been sent out with instructions to explore the dry semidesert areas which border on Chinese Turkestan, where there are forests of wild apples, pears, grapes, and other fruits. It is also planned to have Mr. Meyer get from the high altitude of the Tien Shan Mountains, in western China, types of early-ripening cereals. He will also secure certain leguminous forage crops adapted to cultivation and range improvement west of the Mississippi River.

An interesting development during the year has come in connection with the discovery by Mr. Aaron Aaronsohn, of Hefia, Palestine, of a very interesting wild wheat which grows on the stony mountain slopes and in the clefts of the rocks in the driest portion of Mount Hermon, in eastern Palestine. This wheat grows over a wide territory and is found at altitudes ranging from several hundred feet below sea level to 6,000 feet above, near the borders of snow fields. It is claimed that this wheat is the progenitor of our modern grain and may prove valuable as a stock for breeding strains of wheat adapted to cultivation in the dry, rocky soils of this country which at present are not considered fit for wheat culture. Arrangements have been made for securing this wheat for limited distribution to plant breeders throughout the country.

Legumes for the South.—Special attention has been given to securing leguminous crops for the Southern States in order to make possible greater opportunities in diversification. The farther south we proceed the more limited becomes the number of leguminous pasture or forage crops that can be grown. In Florida the velvet bean has long been one of the important annual legumes. Recent studies have resulted in finding no less than 14 related species, mostly from southern Asia. One of these, the Lyon bean, mentioned in a previous report, is being grown throughout Florida this year. It is decidedly more productive in pods and seeds than the ordinary velvet bean and seems certain to replace it to a large extent. Another

species, the Yokohama bean from Japan, is the earliest sort yet found, maturing in about one hundred days, and is very prolific. This particular bean gives evidence of extending the range of this important crop.

New grasses for the South.—Among the new grasses recently obtained are two that give special promise of high value as hay grasses for the South. One of these is a grass sorghum from the Sudan closely resembling Johnson grass but completely devoid of the rootstocks which render that grass so obnoxious in many localities. Another, known as "Rhodes grass," is a native of Chile, but was first exploited in South Africa. Under Florida and Gulf coast conditions it thrives splendidly and permits of at least two cuttings in a season. The stems are fine and erect and the hay is of very high quality. This grass also gives promise of being valuable under irrigation in California, where extensive experiments with it are under way.

PROGRESS IN GRAIN INVESTIGATIONS.

Work with wheats and other small grains.—Special studies have been made with a view to improving the varieties of wheat and the methods of growing them in the principal grain-producing sections. It will not be practicable to give an estimate of the production of durum wheat until after the next census, but the total for the season of 1909 will probably be not less than 50 million bushels. So rapid has been the spread of this type of wheat that the care and attention necessary to maintain the highest standards in the quality of the grain have not been given. It is important that careful study shall be given to this matter, as the growing of the grain from impure seed or in localities where the climate is not favorable may act detrimentally to the crop as a whole.

Efforts are being made to extend the area of winter wheat, with promising results, the Kharkof variety being especially valuable in this connection.

The work on wheats in California, which has been in progress for five years, has resulted in the introduction and extensive growing of at least two varieties valuable for their yield and milling qualities.

Special work has been conducted in the development of other grains, notably varieties of winter oats and winter barley. The further use of these crops, especially in the South, is much to be desired, offering opportunities for the production of stock foods, through the grain, and also of winter pasture.

Considerable progress has been made in the work of improving American barleys adapted to the principal barley-growing sections of the Northwest. The factors of difference between high and low grade barleys have been studied in a new way—the internal structure of the grain itself—and discoveries have been made that furnish a

more scientific basis for the cross-breeding and selection work which has been inaugurated.

During the year some systematic work on rice has been inaugurated, stations having been established in South Carolina, Louisiana, and California, and at one or two other points. In South Carolina the principal object of the work has been to secure varieties resistant to blight, or blast, and to obtain information regarding improved methods of culture. In Louisiana cooperative experiments have been inaugurated, having for their object the improvement of varieties in use, the introduction of new varieties, the improvement of cultural methods, etc. This work is being carried on jointly with the state experiment station and with the rice planters of Louisiana. In California some preliminary work has been inaugurated to determine the practicability of rice production in that State.

Work on corn.—During the past year the amount of interest shown throughout the United States in all phases of corn work was many times greater than in any previous season. The state experiment stations are now doing a great deal in the matter of encouraging better methods of growing and breeding corn, and the work inaugurated and carried on by the Department is in general line with these studies. It is not the purpose of the Department or the state stations to produce seed corn for farmers, but rather to determine and verify by a sufficient number of experiments and demonstrations the best methods for them to follow in the production of their seed. Particular attention has been given during the year to the breeding of corns for the South and in conducting tests and demonstrations for the purpose of determining the best methods of increasing yields.

Some interesting facts have been developed regarding the effect of different methods of conserving soil moisture on the yield of the grain. In the South, where summer droughts are likely to occur, the practice of planting corn in furrows from 4 to 6 inches below the level, which has been followed so long, has been found to be based upon sound principles, and by actual tests it has been shown that corn grown in this way has yielded from 4 to 5 bushels more per acre than where level cultivation was practiced. The presence of organic matter in the soil is another important factor in increasing the yields. In a number of instances heavy applications of fertilizers, as much as 1,400 pounds to the acre, have not increased the yield as much as a moderate amount of decaying vegetable matter turned under before the corn was planted.

PROBLEMS IN PLANT PATHOLOGY AND RELATED SUBJECTS.

As usual, the lines of work in the study of plant diseases and the means of controlling them have been many and varied. The investigational features have been advanced, but special stress has been

laid upon field tests and demonstrations. During the year studies were conducted in the laboratories on several diseases of the white potato, diseases of sweet corn, crown-gall and other diseases of fruits, a serious bud-rot disease of the cocoanut, and on rice blast and other diseases of rice. During the year the usual efforts have been put forth to augment the pathological collections and to extend the inspection work necessary in connection with the importation, distribution, and handling of the large number of living plants and seeds brought in.

With a view to increasing the efficiency of the inspection work, a special greenhouse is being prepared for this purpose, and a plan is being perfected whereby, through the cooperation of other Bureaus in the Department, it is hoped the danger of introducing diseases or insects will be largely overcome. During the year inspections have been made of more than 150,000 plants sent out from the Department greenhouses and from the various offices of the Bureau.

The work on cotton diseases is now far advanced, and has for its object the distribution of improved disease-resistant varieties that have been developed. For a number of years the truck crops of the Atlantic coast have suffered from various diseases, the causes of which have proved quite obscure. It is found that a number of these troubles are due to malnutrition brought on by the improper use of chemical fertilizers. Investigations have shown the manner in which these diseases work, and suggestions have been secured which it is believed will make remedial treatment practicable.

Important advances have been made during the year in the treatment of fruit diseases. For twenty years the efforts of pathologists have been largely devoted to studies of diseases, comparatively little attention being paid to the improvement of the fungicides used. The main reliance has been upon various copper compounds. Recently these have been found to cause serious injury to certain fruits, and it was highly important that some effort be made to determine the cause of this injury, else spraying would have to be abandoned. Very decided progress has been made in this work by the discovery during the year of a number of what promise to be new and useful fungicides. Apples sprayed with these preparations show remarkably high coloration and freedom from all sorts of spots, rots, and other discolorations due to disease.

On the Pacific coast the important work on the eradication of pear-blight has been continued with encouraging results, special attention being given to this disease in portions of Oregon, where the Department received the very hearty cooperation of the fruit growers, especially those of the Rogue River Valley.

Among the other diseases studied during the year is that known as little-peach. Pecan scab has also been under investigation, experi-

mental demonstrations being started in the southern part of California in the matter of spraying. This work has proved quite successful, and in connection with it other facts regarding the relation of varieties to scab have been obtained, which it is believed will be very useful to the pecan growers. Much work during the year has been conducted in the matter of demonstrations in fruit spraying, this important line of effort having been carried on in connection with various orchard fruits, grapes, and certain small fruits.

STUDIES IN FOREST PATHOLOGY.—Investigations of the diseases of forest, shade, and ornamental trees and shrubs are conducted in cooperation with the Forest Service. One of the most important diseases studied during the year is that affecting the chestnut. This trouble has spread south to Virginia, west at least to central Pennsylvania, and north to Rhode Island. Where the disease is already established nothing can save the trees. General quarantine methods conscientiously applied would probably check the advance of the malady into new localities. Experiments show conclusively that under orchard conditions the disease can be controlled by a definite pruning and cutting-out system.

Another disease of forest trees known as the white-pine blight has been under investigation during the year. Owners of pine may be assured that there is little to fear from this disease, and there is no reason why reforestation with white pine should be further delayed.

Another very serious disease of white pine was called to the attention of the Department during the year and has been made the subject of study. This is caused by one of the rusts and was introduced from Europe into Vermont, New Hampshire, Massachusetts, Connecticut, New York, and Pennsylvania. In many parts of Europe the rust prevents the growing of white pine, and there is no reason for assuming that it would be less serious in America if once established. Efforts have been made to keep the disease from again being imported and to call the attention of the growers of white pine to the necessity for immediate action as soon as the disease is discovered.

SOIL BACTERIOLOGY AND WATER PURIFICATION.—The distribution of pure cultures of nodule-forming bacteria for inoculating legumes has been continued. Perhaps the most interesting feature of the results reported is the benefit due to the pure-culture inoculations where leguminous crops are planted in regions naturally supplied with the proper bacteria. Either the natural forms of the organism are less vigorous or they are not present in sufficient numbers to produce the best results. Cooperative studies are under way in a number of places with special reference to bacterial development and nitrification in soils.

DRUG-PLANT INVESTIGATIONS AND STUDIES OF POISONOUS PLANTS.

Drug-plant investigations.—The work on drug plants and drug-plant crops has covered investigations and studies on camphor, work in connection with the growing of various types of red peppers, investigations of hops, studies of tannin plants, studies bearing on various changes in lemons due to methods of handling, studies of perfumery plants, and tea culture. The outlook for the camphor industry in this country continues bright, in spite of the fact that the price of imported camphor has fallen from the abnormally high figure which was quoted when the work was begun. Private capital has in large part relieved the Department of further work with this crop, with the exception of certain studies having for their object the determination of questions bearing on the importance of the selection of stock for propagation, with a view to increasing the yield of camphor.

For several years cooperative work has been carried on with the farmers of South Carolina in encouraging them to grow certain types of peppers as a feature of diversification. As a result of this work, the farmers this past year produced about 50,000 pounds of dried pods. The crop seems well adapted to the agricultural conditions of the region, and the labor problems have been easily solved. This industry, although a small one, is practically on its feet, and it is believed will be able to largely take care of itself in the future.

The hop work has had for its object the study of individual plants with reference to their yield and quality, in the hope of improving the character of the hop output. Studies of the relation of hop constituents to flavor and other important properties have been continued.

The increasing scarcity of natural sources of tannin material has resulted in a corresponding increase in the importation of tanning extracts, barks, etc., from abroad. It is believed that a considerable portion of these importations might be rendered unnecessary by producing such crops at home. Work is under way along this line, with promising results.

The cooperative tea work is still confined to South Carolina, the small experiments at Pierce, Tex., having been discontinued because of the unfitness of that situation for the work. The crop for the past season in Doctor Shepard's gardens has been excellent and will aggregate about 12,000 pounds of first-class tea. The future of the industry in this country will depend in part upon the elimination of costly labor processes by the development of suitable machinery for handling the crop at all stages. At present the pruning and picking are hand processes. During the year tea-pruning machinery has been devised and tested, with promising results, and it seems prob-

able that next year it will be feasible to do all the pruning by power machinery, thus eliminating one of the great items of hand labor.

STUDIES OF POISONOUS PLANTS.—Studies of poisonous plants during the year have been confined to various phases of the loco work, studies of larkspur poisoning, cooperation in the National Forests to prevent injury to stock through poisonous plants, and some special investigations of Indian corn in its relation to the pellagra disease.

Studies of larkspur poisoning have been continued. This is one of the most destructive factors which the stockmen in certain parts of the country are called upon to meet. A field station has been established at Mount Carbon, Colo., where during the past year investigations have been carried on with the various forms of larkspur and other poisonous plants which occur in the flora of that region. Cooperative work with the Forest Service has led to an expert of the Bureau of Plant Industry traveling through certain of the forests for the purpose of pointing out areas dangerous to stock and to recommend in some cases a change of location of trails, so that these poisonous areas can be avoided. In some cases it has been possible to avoid such areas by means of drift fences and of fences inclosing small areas which were especially dangerous. In this way much valuable aid was given to the stock interests.

The disease known as pellagra is a matter of serious public concern, and while the disease itself is not being studied by the Department, it is important to the work of the Department from the fact that it is suspected that corn may have some relation to it. The scope of the investigations along this line, as already pointed out, covers the determination of the relation of Indian corn to the malady.

TOBACCO INVESTIGATIONS.

During the past year the tobacco work has been conducted in the States of Massachusetts, Connecticut, New York, Ohio, Kentucky, Maryland, Virginia, North Carolina, Florida, Georgia, Alabama, and Texas, and has dealt with improved methods of growing, curing, and handling the crop, this work including fertilizer and crop-rotation experiments, breeding and seed selection, laboratory studies on the quality as affected by composition, and methods of combating important diseases.

After several years of laboratory and field experiment a simple and comparatively inexpensive method of introducing artificial heat into the curing shed has been devised, and it is believed that this method, with possibly some further minor modifications, will provide an effective means of combating pole sweat and other troubles during the progress of the curing. In New York the fertilizer tests have demonstrated to both the grower and the buyer that the yield

and quality of the product can be economically improved by the use of the formulas recommended. The growers are also being taught the value of winter cover crops for their tobacco lands.

In Florida and Georgia it has been found that the most effective method of controlling the troublesome nematode or root knot of tobacco, and thereby mitigating the damage from the Granville wilt, consists in thoroughly clean cultivation in the late summer and early fall, keeping the grass and weeds down, and occasionally stirring the soil throughout the winter.

Work in the export, manufacturing, and bright tobacco districts has been continued on much the same lines as in the past, the primary object being to develop by experiments and to illustrate by demonstrations the best all-round practice for the tobacco farmer to follow in the use of fertilizers and the rotation of crops to secure the maximum results of crop yield and to maintain or build up the general fertility of the soil. The systematic introduction into the rotation of grass and leguminous crops for the joint purpose of supplying feed for live stock and of improving the soil is recognized as one of the most important needs, particularly in those sections where dark tobacco is produced.

SUGAR-BEET STUDIES.

The work on sugar beets has been continued along lines similar to those previously pointed out. The encouragement of sugar-beet seed production is being continued. Through work at a number of stations valuable hybridized strains of beet seed are being produced, and some of them are already in the hands of commercial growers, who are offering American-grown seed of high quality for sale. The work on the production of single-germ seed is being conducted with promising results. It is hoped, by securing special strains of beet seed, to reduce the cost of growing sugar beets and to extend the industry into certain sections where the soil and climatic conditions are at present unfavorable for the best development of the strains now generally used. In all the work involving seed production, methods of siloing seed beets are receiving a great deal of attention. Further work has been continued in the matter of improving cultural methods in connection with the growing of this crop. Preparation of the seed bed, planting the seed, care of the beets, and harvesting are all under experimentation and demonstration. Crop rotation is another important matter being considered in connection with the growing of the beet. New areas not previously devoted to the growing of sugar beets are being tested from year to year, with a view to the extension of the industry. These tests are made as far as possible under field conditions, and if the results are promising the tests are

repeated for several years in succession. By this work there have been located a number of areas that are very promising for the extension of the sugar-beet industry. In conducting these experiments consideration is given as far as possible to the other conditions necessary in sugar-beet production, such as the presence of lime, rock, water, etc.

The use of the by-products of the sugar beet, so far as they are known at the present time, was exhaustively considered in the last Yearbook of the Department, and indicated that in the West lime should be more generally used as a soil improver, as all of our tests show that it has a decided beneficial effect upon the physical condition of the soil.

Special attention has been given to the diseases of the sugar beet, as these maladies in certain sections are very destructive. Root-rot, crown-rot, damping-off, and other diseases of the sugar beet are receiving careful attention. Diseases of plants grown in rotation with the beet have also been studied.

FIBER INVESTIGATIONS.

Many plant fibers and many questions pertaining to fiber production have been investigated during the past year, but attention has been directed especially to hemp and flax, which, aside from cotton, are regarded as the most promising fiber-producing plants for this country.

HEMP.—The preliminary experiments in the cultivation of hemp in Wisconsin in 1908, in cooperation with the state experiment station, gave very encouraging results not only in the destruction of Canada thistle and quack grass but also in the production of fiber. In spite of adverse weather conditions for retting, more than 9,000 pounds of fiber were obtained from 6 acres. This average yield of a little more than 1,500 pounds per acre compares very favorably with the average of 1,000 pounds per acre on the best farms of Kentucky. The hemp was dew retted on the land where it grew, as is the common practice in this country, returning to the soil most of the fertilizing elements taken up in its growth.

Experiments have been continued in Wisconsin in 1909. The severe drought in summer prevented the full development of the hemp, but it has given good results in killing Canada thistle and quack grass. Improved methods used in harvesting these experimental fields this year will reduce very materially the cost of handling the crop.

Machine brakes for preparing hemp fiber are replacing the slow hand brakes, and in some instances, at least, they are doing not only more work but much better work. The satisfactory results with

American hemp binder twine, which has been placed on the market during the last two years, give promise of an extensive market for fiber of medium grades suitable for this purpose.

FLAX.—Flax cultivated for the production of fiber in this country is grown from seed imported from Belgium, Holland, or Russia. Seed, as well as fiber, is obtained from the crop, but without selection the seed has deteriorated so that it does not produce good crops after the second or third generation. Improved varieties of flax for seed production have been developed by careful selection of the experiment stations in Minnesota and North Dakota, but there has been little demand in those States for flax grown primarily for fiber with seed as a by-product. Work has now been undertaken by this Department with a view to the development of improved American varieties of fiber types of flax, and the initial selections have been made in the fiber-flax fields of eastern Michigan.

The introduction of a successful flax-pulling machine and new methods for preparing the fiber more cheaply than heretofore give added importance to this work at the present time. It is hoped that with the improvements in the production of hemp and flax in this country these fibers may win back some of the uses demanding strength and durability which have been usurped in recent years by imported fibers of inferior quality.

FRUIT MARKETING, TRANSPORTATION, AND STORAGE INVESTIGATIONS.

The work in connection with the extension of fruit markets has been considerably enlarged during the year. It includes an investigation of cold storage, of transportation, and of the methods of handling the fruit in preparation for market. There have been a large number of requests from fruit growers' organizations, shippers, and transportation companies for an extension of this work to different parts of the country.

LEMON-HANDLING PROBLEMS.—The California lemon crop amounted approximately to 6,200 carloads in the year ended October 31, 1909. The imports from Italy were equivalent to over 5,000 carloads in the fiscal year 1909. The American lemon as a crop is superior in grade and equal in quality to the European fruit. The industry is increasing steadily in volume. So far as the fruit is concerned the extension of the American lemon trade depends on having lemons that can be laid down in all of the markets of the country in sound condition. In response to the requests of the California growers and shippers, the Department, in cooperation with the leading growers and organizations, is determining the factors that govern the keeping quality of the California lemons. The results so far obtained show that the American lemon has splendid keeping quality and that the fruit may

be shipped in sound condition throughout the United States if it is handled without bruising in the fields and curing houses. As a result of the work already done important changes are taking place in the handling of the crop in California.

California grape-shipping problems.—The shipments of table grapes from California approximate 4,000 carloads. These shipments may be doubled or even trebled when the young vineyards come into bearing. The imports of grapes equaled over 1,000,000 cubic feet in 1909, or the equivalent of about 1,500 carloads. At present the California crop has to be marketed in sixty days. It will be helpful and practically necessary to extend the marketing season over a greater length of time when the young vineyards come into bearing. An investigation has been commenced to determine the relation of the methods of handling and shipping the grape to the losses that occur in transit, and to devise methods under which the marketing season can be lengthened and the marketing area widened. This work has the hearty cooperation of the growers, shippers, and transportation companies, and has already improved the methods in the industry.

Florida orange work.—The Florida orange handling and transportation work was continued during the shipping season. The results have been as clear cut as those which have revolutionized the methods of handling and shipping the oranges in California. They show that the losses in transit are largely due to the rough handling of the fruit in preparing it for shipment. In California the work has been worth at least $1,000,000 a year to the industry. In Florida it has been much less effective, though the methods are changing slowly and the old packing houses are being remodeled.

Improvement in fruit transportation.—During the year a more extensive study has been made of the effect of cooling perishable fruits to a temperature of about 40° F. before shipment. At present fruit, unlike meat products, is loaded for shipment in a warm condition. The temperature of the fruit is reduced slowly in transit, but not fast enough to prevent the rapid ripening of some of the fruits and the decay of others. The preliminary work along this line had shown that fruit that ripens can be marketed over wider areas when cooled before shipment, and that it can be allowed to remain on the tree until it reaches a higher quality before it needs to be harvested.

It has not been possible to conduct these investigations satisfactorily, as cold-storage facilities were usually lacking where needed. A refrigerating plant has been designed and constructed in a specially built car to meet this need. The plant can be moved to any part of the country. It can be used in the experimental work to refrigerate fruit in a warehouse alongside or in a car by blowing cold air from

the coil room of the plant to the warehouse room or to the car containing the fruit. The plant has been located at Riverside, Cal., where a study has been made of the effect of cooling oranges at different temperatures and with different degrees of rapidity. Later in the season it will be used in the grape-shipping investigations in central California.

These investigations are revolutionizing the methods of shipping fruits in some parts of the country. They have shown not only that the losses in transit can be reduced and the marketing area extended, but also that the freight-carrying capacity of a car can be increased by loading the packages closer together, and that possibly there may be a saving of ice in the car in which the fruit is loaded in a cold condition. The work has had the cooperation of the growers, shippers, and transportation companies. The transcontinental lines running out of California are now constructing plants where train loads of fruit can be quickly cooled after loading, and several plants have been constructed by organizations of growers in connection with their packing houses.

PROGRESS IN GRAPE INVESTIGATIONS.—The viticultural investigations on the Pacific coast to determine the adaptability of resistant stocks to soils and the congeniality of the leading varieties to such stocks is progressing satisfactorily. The cooperative vineyards in California now contain 415 vinifera and 277 resistant varieties, with 271 vinifera varieties grafted on resistant stocks. The study of the Rotundifolia type of grape in the South is progressing as rapidly as the funds available permit.

ADAPTABILITY OF FRUIT VARIETIES.—The study of the adaptability of fruit varieties to soils and climatic conditions has been continued in Arkansas, the fruit crop of most of the other sections of the central West having been injured by spring frosts. The dry-land fruit studies have been extended, and an effort is being made to show the forest rangers how to grow fruits and ornamental plants around their cabins.

PECAN CULTURE.—In the pecan investigations in the Southern States special attention is being given to the investigation of the self-fertility of varieties and to the discovery and study of varieties adapted to different sections.

ARLINGTON EXPERIMENTAL FARM AND HORTICULTURAL INVESTIGATIONS.

The usefulness of the Arlington Experimental Farm to the Bureau and to the Department as a whole increases each year. As a result of tile draining and the plowing under of leguminous and other crops for green manure, the productiveness of the soil has been greatly im-

proved. Not only has crop production been increased thereby, but the physical condition of the soil has been modified, so that it is less affected by excessive rains or by drought than formerly. It is now possible to cultivate during seasons which were prohibitive of crop production prior to the establishment of these improved practices.

Plant-nutrition investigations in the trucking areas of Virginia and Long Island have progressed far enough to demonstrate the advantages of a systematic crop rotation in which a catch crop turned under plays an important part. The decomposition of vegetable matter in the soil stimulates desirable activities and corrects the evil effects of the excessive use of high-grade fertilizers.

Vegetable testing.—The results of the year's work in testing some 1,200 so-called distinct varieties of vegetables have shown that in a great many cases seedsmen send out under varying varietal names stocks whose only difference is the degree to which they are uniformly of the same varietal character and that the use of different varietal names to distinguish what are in reality simply different grades or strains of the same sort is a very common practice of even our best and most reliable seed firms.

Recent cultural studies of potatoes have disclosed the fact that certain varieties possess greater drought-resisting powers than others. The economic importance of a further study of varietal adaptations to varying soil and climatic conditions can hardly be overestimated. The selection of varieties best suited to each important potato-growing section of the United States would materially augment the income from this crop.

Cooperative marketing of crops.—One of the most promising tendencies of the day is the spirit of cooperation and mutual helpfulness which is beginning to manifest itself among the producers of truck crops. The successful organization and working of cooperative marketing companies or exchanges by farmers have proved the possibility as well as the desirability of a system of marketing which shall have headquarters at the point of production. Products can be distributed more economically and more satisfactorily to the consumer from the point of production than from a city distributing center. The work of one of these cooperative organizations has come under the notice of the Department during the past year. Of an aggregate business of $2,500,000, this organization was able to handle 90 per cent of its work from a central office in the growing district on an f. o. b. shipping-point basis. The prices received were equal to New York and Philadelphia prices in all cases. The net results of these operations were the elimination of losses which inevitably result from consignment, practically cash transactions for all sales, and the saving of transportation from the field to the center

of distribution in one of the large cities, which in this case added $150,000 to the farmers' profits on the year's business.

DOMESTICATION OF THE BLUEBERRY.

Experiments in the cultivation of the blueberry have been continued. A report on these experiments, now in preparation, will contain the detailed information needed by private experimenters to enable them to handle these peculiar plants with success. The failure of the experiments with blueberries at some of the agricultural experiment stations has been due chiefly to the fact that it was attempted to grow these plants in the ordinary fertile garden soil suited to other small fruits. From the experiments now made it appears that the blueberry not only prefers an acid soil but will not thrive in any other than an acid soil. In the choicest type of agricultural land, mellow, well drained, well aerated, fertile, and of neutral or slightly alkaline reaction, so that the nitrifying bacteria perform their work with the highest degree of efficiency, the blueberry either dies or maintains a feeble and fruitless existence; but when grown in a raw, acid soil, snch as is commonly found in swamps, or on moist mountain slopes, or on the surface of sandy oak or pine lands, the blueberry takes on a luxuriant growth, a fact that is remarkable when one considers that these same soils are one of the poorest types for ordinary agricultural purposes, and that because of their acidity the growth of the nitrifying bacteria, so essential to most crops, is very greatly reduced or altogether inhibited.

The prospective addition of the blueberry to our list of cultivated fruits is of interest not only because of the deliciousness and popularity of the blueberry as a fruit, but also because it means the utilization of land now regarded as almost valueless for agricultural purposes. There is every reason to believe that the application to field conditions of the experimental results thus far secured will place the possibility of the commercial cultivation of the blueberry on a new basis.

DEPARTMENT GREENHOUSES, GARDENS, AND GROUNDS.

The work of maintaining and caring for the Department grounds and greenhouses has continued satisfactorily. A number of changes are under way as a result of clearing the grounds surrounding the new building of the Department, and these will greatly improve the general appearance of the Department grounds. A new range of greenhouses is being erected to take the place of an old range, which will be demolished, and other improvements are being brought about. The work in the greenhouses has progressed satisfactorily, including the improvement of plants by hybridization and the development of new and improved methods of handling greenhouse crops.

CONGRESSIONAL SEED DISTRIBUTION.

The distribution of seeds and plants on Congressional order was continued during the past year along the same general lines as previously. Owing to the higher price of vegetable seeds, the quotas assigned to each Member of Congress were slightly smaller than in former years. The packeting, assembling, and mailing of the vegetable and flower seeds were carried out satisfactorily under contract, as formerly. Particular attention has been devoted to the development of improved methods of cleaning the seed obtained for Congressional distribution, and its quality has been greatly improved thereby. Another line of work connected with the seed distribution which should be mentioned is the effort to bring about the home production of Dutch bulbs in sufficient quantity to build up a new industry. There are sections of the Pacific coast region which seem well suited to the production of these bulbs, and experiments are under way to determine whether their cultivation can be carried out on a successful commercial basis.

PURE-SEED INVESTIGATIONS.

The seed-testing laboratories of the Bureau have continued their efforts in the interest of pure seed for the farmer. Three branch laboratories are now in operation, in cooperation with the experiment stations of Nebraska, Missouri, and Oregon. At these laboratories, as well as at the main laboratory in Washington, many hundreds of samples of seed submitted by farmers and seedsmen are being tested for the presence of adulterants, as well as for purity and germination, and the results of these tests reported.

In accordance with the authority granted by Congress, samples of seed of forage crops have been collected and examined, purchases being made of those showing signs of adulteration. This work has been conducted along lines followed in the past, the names of firms whose seeds are found to be adulterated being published. It is very gratifying to state that the practice of seed adulteration has in this manner been practically stopped, save in the cases of orchard grass and Kentucky bluegrass, and quite materially reduced even in these cases.

An educational movement for the purpose of encouraging greater interest in good seed has been carried on by means of lectures and lantern-slide demonstrations at farmers' institutes, several weeks having been spent in this work. During the past year opportunities have been afforded persons interested in pure-seed work to study seeds and approved methods of seed testing in the main laboratory at Washington. Representatives from several prominent seed houses preparing to do their own seed testing were among the number, and as

a result several have purchased apparatus preparatory to fitting up laboratories in their own establishments. Hundreds of authentic samples of common weed and economic seeds, put up in vials labeled with their common and scientific names and packed in herbarium trays, have been distributed, to be used for reference, thus enabling individuals to become familiar with the more common economic seeds and their impurities.

PAPER-PLANT INVESTIGATIONS.

A good beginning has been made in the investigation of cornstalks, rice straw, and other similar crop materials to determine their value for paper manufacture, in accordance with a recent appropriation for this purpose by Congress. Arrangements have been made for a series of field and laboratory experiments to determine the comparative fiber value of the crops mentioned and to secure proper material to serve as the basis for tests on a large scale in cooperation with paper manufacturers. In the laboratory tests, cooperation with the Forest Service and the Bureau of Chemistry will be entered into. The object of these experiments is to show decisively whether or not paper can be economically roduced on a large scale from cornstalk broom-corn stover, rice straw, and other crop materials which are at present more or less waste products.

COTTON STANDARDIZATION.

During the past year substantial progress has been made toward the establishment of official grades of American cotton, in accordance with law. In February, 1909, a committee of representative cotton men, called together in Washington, unanimously recommended the adoption of official cotton grades and submitted a set of types which in its opinion fairly represented the grades sought to be established. Preparations for the promulgation of these grades have been going steadily forward, and it is expected during the present year to place sets with the principal associations, organizations, exchanges, and agricultural colleges most interested in cotton. It is also hoped that the work of more generally distributing the grades by sale may soon be undertaken.

GRAIN STANDARDIZATION.

The work in grain standardization during the past year has continued to bring forth much valuable information and many data relating to the value of the factors of quality and condition in fixing commercial grades of grain and the importance to the American public of those grades, as well as of the methods and practices of fixing them. Efforts have been exerted toward bringing about a

better understanding of the various phases of the problem of grading commercial grain, and much good has been accomplished. As the possibilities of the work come to be better understood, it is fast gaining the support and cooperation of progressive grain merchants, grain-elevator owners, and grain-carrying railroads, and there is a growing appreciation of the Government's interest in commercial grain problems.

The work of investigating the condition of American cargoes of grain on arrival at European ports during the past three seasons, as mentioned in the last report, has been brought to a conclusion, and the data bearing upon the important phases of that work, together with other information collected which is of value to the grain interests, are now being prepared for publication.

The results of the grain-standardization work are being manifested in many ways, principally in an increased activity among influential grain interests toward bringing about more satisfactory conditions with relation to grain-inspection practices, with the noticeably desirable result that the grain trade generally is beginning to realize the seriousness of the question. The introduction into the grain business by the Department of Agriculture of a quick method for testing moisture in grain has proved an important factor in causing greater care to be taken of corn on the farm, as it has been instrumental in educating the grain buyer and handler with regard to the moisture content and its effect upon grain values. This has no doubt been an active influence in the disappearance of the open-rail corn-crib or pen from the corn belt. Railroad and elevator companies are becoming interested in the work, because of the close relation of some of its phases to a subject of much interest to them, known as "natural shrinkage" in commercial grain.

SPECIAL PLANT INTRODUCTION AND TESTING GARDENS.

The special field gardens of the Bureau have made good progress during the past year and have proved a valuable aid to the various lines of investigation conducted throughout the country. The Plant Introduction Garden at Chico, Cal., has been improved during the year, and arrangements have been made to undertake definite work at that point in the extensive propagation of the various seeds and plants secured through introduction and otherwise. The services of a plant breeder of wide experience have been secured for this work.

The South Texas Garden, at Brownsville, has been further developed during the past year and has increased its efficiency in aiding the settlers in the surrounding country. An investigation of the possibilities of southern Texas for citrus-fruit culture was made during the year and the results published. The Subtropical Garden, at Miami,

Fla., has been practically discontinued, the greater portion of its work having been turned over to the local authorities of Miami under a cooperative arrangement. This plan will enable the Department to direct its energies in southern Florida to a general series of field experiments and investigations, thus affording greater aid to the region as a whole.

FARM MANAGEMENT.

The Bureau has continued to study the methods and practices on the most successful farms throughout the country, and a great quantity of valuable information has been acquired, which is being put to practical use by way of demonstrations, experiments, etc. In addition to the general lines of farm-management work, the Bureau is making special studies of farm practice in the use of fertilizers; the field management of weeds and their relation to tillage practices; the production, curing, and marketing of hay; the economic handling of pastures; and the production of strains of cassava for the South that will reproduce true to seed. Three such strains of cassava have been produced and are now being propagated on a considerable scale. By propagating this crop from seed instead of from cuttings the region to which it is adapted can be greatly extended, especially in those sections of the Gulf coast where corn does poorly.

USE OF LEGUMES IN THE SOUTH.—Our work during the past few years in encouraging the use of leguminous crops in suitable rotations for the rebuilding of exhausted soils is showing marked results. As compared with five years ago, cowpeas are more extensively grown all over the South, and improved methods of saving the seed through the use of machinery have become established in various localities, particularly in eastern Tennessee and southeastern Missouri. Other leguminous crops have become established and are being used in rotations in scattered sections. The extended use of vetch is pronounced in North Carolina and South Carolina and parts of Georgia and Louisiana, while bur clover prevails in northern Alabama, crimson clover in Virginia, Japan clover in Louisiana, Arkansas, and Mississippi, and alfalfa in the black, waxy, and alluvial soils of all the Southern States.

FARM PRACTICE IN PRODUCING FORAGE FOR STOCK.—Our work in the West and also in New England has been directed more especially toward improved methods in the use of suitable forage crops for sheep and hogs and the devising of proper cropping systems in stock production. The sheep industry in the New England States, for some time thought decadent, is proving profitable under capable direction and is a type of farming well suited to much of the rough pasture land of those States. There is also a demand for cheap, light-weight, native pork in New England, and the value of such pasture crops

as rape, clover, and peas is being brought to the attention of the farmers.

CROPS FOR CUT-OVER AND STUMP LANDS.—Observations of the sandy jack-pine cut-over lands in Michigan, Wisconsin, and Minnesota have been continued and work has been begun in the growing of hairy vetch as a seed and forage crop suitable for these lands. Large quantities of hairy vetch are now grown throughout the Atlantic Coast and Southern States as a soil-improving, forage, and winter cover crop, the seed for which is nearly all imported. The light, sandy soils of the North promise to be well adapted to this crop. Another important problem in some of the central-northern States, where lumbering operations have been extensive, is the successful handling of stump lands. The value of various stumping machines and equipment, as well as of dynamite and certain other powerful explosives, in the economic clearing of these lands for settlement is being studied.

VARIOUS FARM-MANAGEMENT PROBLEMS.—In the Pacific Northwest special attention is being given to improved methods of handling the wheat lands of eastern Washington and Oregon and of northern Idaho and to the working out of practical cropping systems for the farms on the new irrigation projects of this territory. In certain sections of the Middle West the soil is peculiarly adapted to corn, and exploitative systems of continuous corn culture, in occasional alternation with oats, have frequently been continued until the yields of both crops were so low as to make this type of farming entirely unprofitable. The necessity for changing this type of farming to some profitable kind has forced itself on landowners, who have applied to the Department for plans. To meet this demand a paper outlining methods of successfully attacking the problem was issued.

COST OF PRODUCING FARM CROPS.—The cost of producing farm crops and the time necessary to perform certain farm operations are being studied as a basis for making farm plans. In this work the Bureau is cooperating with successful farmers in different sections of the country, who send in daily reports of work done. Bookkeeping, while a vital part of successful business enterprises, has never been popular on the farm because of its complexity. A simple system of farm accounts and supplementary records has been worked out and tried on a number of farms during the past year, with most promising results. The study of farm machinery and of the relation of machinery to farm management and farm profits has also been studied.

WORK WITH THE PRICKLY PEAR.—In southern Texas the prickly pear has proved a valuable farm forage crop for cattle, sheep, and swine and the best insurance against stock famine that can be grown in that section. It has been proved that the prickly pear, well culti-

vated, will seldom, if ever, suffer from drought in southern Texas, while the uncultivated cactus often does. By breeding the least spiny, most prolific, and hardiest native pear with the spineless cultivated forms it is hoped to secure a prolific spineless form that will be hardy in that section; but until this is accomplished the spiny native pears should be used. About 10 tons of cuttings of the spineless varieties of pear were distributed during the year to settlers in the less frosty sections of the country, where there is a probability of their successful growth.

FARMERS' COOPERATIVE DEMONSTRATION WORK.

The demonstration work among southern farmers has made rapid strides during the past year. Any observer of farm crops in the United States has noticed that a few farmers secure a good yield almost every year regardless of seasons or pests, while the great majority of farmers make only moderate returns the best seasons and between these secure only partial yields or have total failures. The advent of the boll weevil in the cotton States accentuated this situation and enormously multiplied the failures until a total wreckage of that great fiber industry was threatened. Primarily to meet this condition the Farmers' Cooperative Demonstration Work was inaugurated upon an extensive scale by the Bureau of Plant Industry in January, 1904.

Plan followed in the work.—The central feature of the work consists in placing a practical object lesson before the farmers through demonstrations made upon their farms, exemplifying the best and most profitable methods of producing the standard farm crops. It is an effort to show the farmer a way to help himself under such direction and guidance as this Department may be able to furnish. The most important factor in the improvement of agricultural conditions is the man on the farm. Unless he can be aroused and impressed with the necessity of securing better results, there is little hope of permanent reform in methods. The evolution in the man must come by personal achievement, and the only achievement open to the average farmer is greater accomplishment upon his farm. A better crop, or a better farm, or better conditions of life, give him local prestige and leadership. As far as practicable, it is the plan of the work to secure enough object lessons in each county to permit one or more to come under the immediate observation of every farmer, and then to secure the cooperation of all for further trial. This method of teaching appeals as forcibly to those who do not read as to those who do. It reaches and convinces all classes and apparently is the only method by which rapid and radical changes of methods long established can be secured.

Development of the work.—If the increasing demand for the work is a measure of its value, then it is certainly accomplishing the

objects for which it was inaugurated. It has increased in the past six years from 1 field agent to 362, and from 1 farm under supervision to more than 60,000 farms, including those classed as cooperating. The work is now being conducted more or less extensively in twelve States, and has been influential in securing to a considerable extent the addition of humus to the soil and an improvement of soil conditions, a better preparation of the soil for crops, the use of better varieties of cotton and corn, almost universal attention to seed selection, more intensive cultivation, the better storing of crops, the production upon each farm of the foods necessary for the support of the families and teams working the farm, more pastures and meadows, more and better teams and implements, more live stock, great improvement in farm and home conditions, more months of schooling, and better rural conditions.

EXTENSION OF THE WORK THROUGH VOLUNTARY CONTRIBUTIONS.—Agencies other than those of the State have very materially aided the rapid extension of the work. In a large number of counties in Mississippi, North Carolina, Texas, and other States the people themselves have made considerable contributions to secure additional time and service from a local agent of the Department. In other words, when the Department funds were only sufficient to employ a man a part of the time the county supplemented the amount and secured the full services of the agent.

BOYS' CORN CLUBS.—In the boys' corn clubs of the Southern States there were enrolled the past year 10,543 boys, who were required to work a plat of ground upon their fathers' farms under instructions from the Department. These demonstrations served a double purpose, practical education and encouragement to the boy and a valuable lesson to the farmer, as the yield of corn on the boys' plats was generally many-fold the average product of the farm. Greater interest was manifested in this work by the citizens of the county than in demonstration work among adult farmers. Ten thousand dollars in prizes were contributed by public-spirited citizens to encourage boys' corn clubs during the past season.

EFFECT OF THE WORK.—The Farmers' Cooperative Demonstration Work as a method of practical instruction has been widely adopted by colleges, normal schools, industrial schools, rural high schools, and some common schools in the management of the farms or plats of land attached. Some rural schools have asked cooperation to work land for instruction, the proceeds to be applied to the purchase of a library or the extension of the school term. In a similar way church societies have placed lands under the demonstration methods to provide funds for special expenses. The work has made a special appeal to the colored farmers and has helped them in improving their farm methods and in promoting better conditions of living.

FOREST SERVICE.

The Forest Service manages a great producing property. It carries on investigations that will enable private property to be put to better use. It seeks to diffuse and get into practice the knowledge which its scientific studies yield. But of first importance is its work in caring for the National Forests.

THE NATIONAL FORESTS AS PUBLIC PROPERTY.

All told, the proclaimed boundaries of the National Forests now include nearly 195 million acres of land. This is nearly 27 million acres more than a year ago. Of the gross area, however, much belongs to States and private persons. Through grants by Congress and the patenting of claims under the land laws there has been alienated about 16 million acres. Many other claims are pending. Altogether the actual National Forest property, exclusive of all alienations and unpatented but valid claims already pending, comprises 147 million acres of land in the continental United States, with 26 million acres more in Alaska. This vast property belongs to all the citizens of the United States jointly, and is in my charge to manage for their benefit, just as the holdings of any private corporation belong to the shareholders and are managed for them by the corporation's officers.

One obvious difference between this productive property which belongs to the public and the holdings of even the greatest private corporations in the land is the far greater size of the public holdings.

The administration and protection of the National Forests cost last year less than $3,000,000, with an additional $500,000 spent on improvements. The cash receipts for the year were not far from $1,800,000.

Of the three principal resources of the Forests—water, forage, and timber—the timber is for the time being the least developed. Receipts are no measure of the present use made of all three resources. Explanation of what the public is getting out of its property—an intelligible statement, in other words, of what truly constitutes the credit side of the National Forest income account—requires that these products be considered separately.

THE WATER YIELD OF THE FORESTS.

From the nature of the case the value of the Forests as regulators of stream flow and conservers of the supply available for irrigation, power, and navigation defies statement in terms of dollars and cents. But there is no important stream in the West whose waters are not through the dry season drawn mainly from the National Forests. The overwhelming weight of common experience as of scientific observation recognizes the important service of the forest

in preventing erosion and equalizing the flow of water from mountainous regions. Without the water protection secured by the National Forests, this greatest of western resources would grow progressively more inconstant and less valuable.

But the Forest Service is doing more than merely safeguarding present water supplies. Partly as a result of the work of civilized man, partly as a result of purely natural causes, the forests of the West are almost everywhere not in the best condition. Destructive lumbering, unregulated grazing, insect damage, and fire have all played their part, but fire has been by far the most harmful. Seldom can any extent of forest be found without old burns, or a mountain range that is not scarred by great stretches of unwooded or half-wooded slope. From as far back as the trees bear record, fires have raged in the western timber. During last year the principal cause of fires in the National Forests was railroad locomotives; the second, lightning. Man and nature have both sent the fire to thin or sweep away the protective cover of the mountain sides. But the fires are no longer allowed to burn until they go out or are put out by rain. Vigilant protection is now given the Forests, and this will mean the steady improvement of water conditions in the West.

Regulated grazing also makes for better water conditions. In the Tonto Forest, for example, sheep grazing on certain parts of the Salt River watershed has been found by the Reclamation Service to be injurious to the interests of the Salt River project, and accordingly the Forest Service, after fair notice to the stockmen who have been using these parts of the range, will close them to sheep. This, however, is an extreme case. Usually stock under proper regulations can utilize the forage crop without harm to the water supply, and are permitted to do so under the present system.

Thus the water yield of the Forests is both conserved and improved. Except for an insignificant amount paid for special-use permits by certain power companies, the receipts of the Government from the Forests show not a penny the better for this resource. But the Forests pay their owners, the people, more direct dividends. Not only the users of water throughout the West but all who in turn derive a benefit from the prosperity of these users share in the distribution of profits. As public property the National Forests serve their proper function by contributing to the general welfare. To measure their usefulness by the charges collected would be a very great mistake. Of their three main uses that for water is far more important than their use for forage or for timber supply, yet it results in the collection of almost no charge at all.

THE FORAGE YIELD OF THE FORESTS.

The use of the forage crop of the Forests brings a profit to the public partly through the payment of charges by private individuals

for the grazing privilege, but chiefly, as does the water, through the promotion of the general welfare. Though the grazing charges brought into the Treasury of the United States over $1,000,000 last year, the administrative expense of regulating the use of the range cost the Government nearly as much. In truth, grazing fees are fixed with a view primarily to meeting the expense of regulation, not to raise revenue. The charge for the grazing privilege was far lower than that usually paid by stockmen to owners of private land. Were the National Forests the property of an ordinary corporation, concerned not with the interest of all the people but only with that of a limited body of shareholders, grazing might have furnished at least twice as great an income as it has furnished. In other words, had the stockmen paid the full market value of their use of the National Forests, the receipts from all sources would very nearly, if not quite, have balanced the cost of administering and protecting the Forests.

Such a commercial policy was not pursued because it would have meant sacrifice of an opportunity to promote the public welfare in the best way. It is of course just that the stockmen who profit by use of the National Forests should make a reasonable return for the privilege which they receive; but it is of first importance to prevent monopoly of the range by a few men, and make it do its share toward building up stable communities of independent American citizens. Hence the charge is fixed at what the man newly starting in business and without much capital can reasonably pay; and room is made for such men on the National Forest range, if necessary, by reducing the number of stock large owners are allowed to graze.

Thus the forage yield of the Forests, which sufficed for nearly 7,700,000 sheep, 1,500,000 cattle, 90,000 horses, and 150,000 hogs and goats, was utilized by more than 27,000 individuals and concerns, besides furnishing free grazing for milk cows and work horses of settlers, prospectors, travelers, etc. For every permit allowing the grazing of 4,000 or more sheep and goats there were 7.4 permits for 1,000 head or less, and for every permit allowing 200 or more cattle, horses, or hogs there were 9.4 permits for 40 head or less. The average number of sheep and goats to each permit was 1,541 and of cattle and horses 71. Thus what stands to the credit side of the grazing account is the wide usefulness of the range and the healthy upbuilding of communities, rather than the $1,000,000 of receipts.

THE TIMBER YIELD OF THE FORESTS.

The use of National Forests as sources of timber supply is less developed than their use either for water or for forage. The reason for this is obvious. The grazing industry in the West has expanded until it has reached almost everywhere the full capacity of the range in its present condition. The profitableness of irrigation and the

steady demand of home makers for new land have led to water appropriations on a large scale, while power development, though in its infancy, is already seeking strategic positions and preparing for widespread application. But the timber of the National Forests is, comparatively speaking, in little demand. Its day has not yet come.

The additions made to the Forests last year brought the total estimate of timber to about 400 billion feet, exclusive of Alaska. The cut of the year was not quite 460 million feet, or a little over one-ninth of 1 per cent of the stand. In other words, it would take nearly 900 years, at this rate of cutting, to remove the present stand. Since the forests grow, after such cutting as takes place under Forest Service methods, at the rate of about 1 per cent of the original stand annually, only about one-ninth of the potential forest crop was harvested.

The cut of last year, however, was abnormally small. It was even less than that of the previous year, which in turn, as I explained in my Report for that year, was restricted in accordance with a policy dictated by the public interest. As the methods of the Forest Service are worked out, and as the demand for National Forest timber becomes greater because of the diminishing supply in private hands, it will be wise to encourage such sales as will serve the people, while holding sufficient timber in reserve and providing safeguards against monopoly control of the market. Already it is clear that the cut of the coming year will be much greater than that of the year just closed.

EFFECT OF GENERAL CONDITIONS ON NATIONAL FOREST BUSINESS.

The small timber cut of last year illustrates the fact that National Forest business is affected by the same conditions as business generally. As with private producing property, the use made of these public Forests varies with the commercial and industrial activities of the nation. The depression which followed the panic of 1907 is recorded in the totals of National Forest business, just as in the totals of other kinds of business. But it is a striking fact that National Forest business suffered what was rather a check upon its rate of increase than a serious retrogression.

The receipts from the National Forests in the fiscal year 1907 were about $1,530,000, an increase over those of the previous year of over 100 per cent. In the fiscal year 1908 they were about $1,790,000 and in that of 1909 about $1,765,000. It is now clear that during the present year they will reach a higher figure than ever before. In other words, instead of falling off violently in response to the period of business depression they remained nearly stationary during the two bad years and are now resuming their advance.

This relative stability of National Forest business in the face of adverse general conditions unquestionably points to increasing use of the Forests. What would have shown normally as a considerable gain in receipts here appears in the prevention of any marked decline. But another cause also is involved. Beyond a doubt the fact that National Forest business has other than purely commercial ends helps greatly to maintain a steady volume of use. This is not without its importance to those who make commercial use of the Forest resources and to business interests generally. In certain ways the Forests worked as a counterpoise to the general business depression. This will appear when the principles which govern the disposal of grazing privileges and the making of timber sales are considered.

From these two sources come almost all the National Forest receipts. Grazing, as has already been said, paid last year a little over $1,000,000; timber sales, $700,000. In the case of neither is the obtaining of the largest possible revenue the administrative aim. Had the stockmen of the West faced the necessity of paying grazing fees raised to the limit of what they could afford, the disturbance which began in the fall of 1907 must have had a far more serious effect on their industry, and the consequences would have been felt later in the prices of beef and mutton to the consumer.

So, also, in making sales of National Forest timber, the best interests of the consumer furnish the guiding principle. Small sales are preferred to large sales, though they mean a lower price for stumpage, because they promote local enterprises, tend to prevent market monopoly, and at the same time make possible better provision for the welfare of the forest. It is the operator on a large scale who shuts down when times are bad. The little mill continues to run, continues to give employment to its hands, and continues to turn out material for local use.

Had it not been for the large number of small sales a very great falling off in the cut of National Forest timber would probably have marked the year. Operations under large sales usually extend over from three to five years, so that the cut of each year includes much timber that was disposed of under sales of previous years, and the amount cut in a given year may be either much more or much less than the amount sold. In the fiscal year 1907 over 1 billion feet of timber was sold, but less than one-fifth of this amount was cut under sales. In 1908, 386 million feet were sold and something under 393 million feet were cut. But in 1909 the sales fell below 287 million feet, though the cut was 353 million feet. This was a decrease of 26 per cent from the sales of the previous year. Yet the number of sales for less than $500 worth of stumpage was within 1.2 per cent of the number for 1908. In other words, the small sales remained nearly constant, while the larger sales fell off heavily—as would be expected in a

year of dull business. In short, had it not been for the steady demand of small purchasers and for the cutting under sales made before the trade reaction set in the National Forest timber business would have been quite as stagnant in the fiscal year 1909 as that of the lumber business generally.

Since but a small fraction of the potential timber crop of the National Forests is now cut, the most important duty which its care immediately imposes is the protection of the great supply on hand. As producers of timber these Forests should be considered a property the development of which has hardly begun. With increasing population, better means of transportation, and acute general demand when other supplies run short, the country will have abundant future use for this timber. That the sales are at present so small is no reason against taking the very best care of what will within a few years repay with heavy interest all that its care is costing. Private owners of valuable timberlands are well content to hold and protect them. It is well that the public can do the same.

WORK OF THE YEAR.

A notable change in organization was put into effect on December 1, 1908. Previous to that time all the work on the Forests had been directed immediately from Washington. Now six district offices, located at Missoula, Mont.; Denver, Colo.; Albuquerque, N. Mex.; Ogden, Utah; San Francisco, Cal.; and Portland, Oreg., have charge of the execution of all National Forest business. Only the larger questions of administrative policy are now handled in Washington. In consequence, business is transacted with far greater dispatch; close touch between office and field is easily maintained, and efficiency along all lines of work has been vastly stimulated. It is already clear that this was the most important forward step ever taken by the Forest Service—taking the Department to the people.

The cost per acre of National Forest administration was virtually the same as last year. Appropriations 14 per cent greater were applied to a gross area 11 per cent greater at the beginning of the year, and 18 per cent greater at its close, than at the same times the year before. On the basis of the gross area under administration at the end of the year, the expenditure for all purposes, including improvements, was 18.3 mills per acre; or, on the basis of the area exclusive of alienations, less than 20 mills. Since to protect the National Forests it is usually necessary to protect also alienated land within the Forests, the first figure more fairly represents the facts. In either the expenditure was less than 2 cents per acre. This contrasts with expenditures of from $1 to $2 or more per acre, which are annually made upon the highly lucrative forests of France, Germany, and Switzerland.

One-sixth of this expenditure went to making and maintaining improvements—chiefly trails, roads, telephone lines, and quarters for Forest officers. These improvements benefit both the Forests and the public. They make protection of the Forests far more effective and economical, provide better facilities for the transaction of business with Forest users, and serve the convenience of the public generally. The amount available for this work has only partly met the most urgent demands. If the Forests are to be adequately cared for and their usefulness is to be developed, they must be far better equipped with means of communication and transportation than they now are. The money thus spent is in reality an investment by the Government for the betterment of its own property and for the general welfare.

Deducting the cost of improvement work, there is left something over 1½ cents per acre as the cost of administration and protection. This includes a fair proportion of the general expenses of the Forest Service at Washington, as well as all expenditures made directly on behalf of the Forests. Since all forms of use by the public involve cost to the Government for supervision, and since use is increasing yearly, the amount available for fire protection is dangerously small and certain to be smaller unless tbe appropriations for the Service keep pace with the growth in use.

The desire of associations of timber-land owners in the West to give organized protection to the holdings of their members opened the way to an arrangement for joint action against fires by the Forest Service and certain of these associations where the private timber involved was within or near National Forest boundaries. An embarrassing difficulty arose from the fact that these private owners wished to spend more money per acre for fire protection on their own land than the Government had available for the Forests. This compelled the lumbermen to choose between paying part of the cost of protecting the public holdings and giving their own holdings less protection than business prudence called for. The situation illustrates how small, in proportion to the work to be done, is even the most liberal provision made in the past for the needs of the Forest Service. Agreements for cooperative fire protection were, however, concluded with the Potlatch, Coeur d'Alene, Pend Oreille, and Clearwater Timber Protective Associations, in the State of Idaho.

The forest-fire season of the summer and fall of 1908, disastrous throughout the country, brought relatively insignificant losses upon the National Forests. Statistics of fire losses are kept by the Forest Service not for fiscal but for calendar years. During 1908 fires on National Forests destroyed about $450,000 worth of timber. Of 2,728 fires reported, 2,027 were confined to an area of 5 acres or less.

At the request of the General Land Office claims on National Forests are examined by the Forest Service before patent is issued, in order that the Land Office may be cognizant of any facts bearing on the validity of the claim, which such field examinations may disclose. During the year 5,610 claims were examined and facts favorable to the claimant were reported in 3,003 cases and unfavorable in 2,112. Patents were issued by the Interior Department for 1,583 claims within National Forests, of which 633 were homestead entries, 514 timber and stone entries, and 425 mineral entries. While it is not desired to obstruct needlessly the perfecting of valid claims by bona fide entrymen, the interest of the people in their own property lays upon the Government the duty of protecting the Forests against unlawful attempts to patent the land.

There were listed under the Forest homestead law of June 11, 1906, 1,450 tracts of National Forest land, with a total acreage of about 140,000 acres.

An impression that the National Forests contain large areas of agricultural land to the exclusion of settlement and large areas of untimbered grazing land unjustifiably brought within the National Forest boundaries for the sake of grazing has gained wide currency. To satisfy myself on the ground as to the facts, I made personal investigation of these matters during the past summer in the States of Idaho and Wyoming.

Presumably the time will come when some portions of the present Forests can with benefit to the community be converted into farms. Through dry farming, plant breeding, and the introduction of new forms of useful and drought-enduring vegetation, agriculture is steadily gaining upon the desert, and may be expected to gain on the forest in semiarid regions. Growth in population also will bring an increasing demand for farm land. But it will also bring an increasing demand for timber and water conservation. The present is not the time to decide where the line should finally be drawn.

I found no evidence that the National Forests are withholding from settlement land now demanded for agriculture. As to grazing land, it is sufficient to say that proper administrative control of National-Forest grazing has necessitated the fixing of the boundaries where they now are, that public sentiment in the States visited is strongly in favor of the maintenance of the existing boundaries, and that representations that great areas of land are held for other than Forest purposes are in my judgment wide of the facts.

The total cut of National Forest timber during the year was nearly 460 million board feet, of which over 100 million feet were given away under free-use permits. The receipts from timber sales for the year were about $700,000. Free use of timber was heaviest in

Idaho, with over 18 million board feet, followed by Montana, Colorado, Utah, and New Mexico, with amounts ranging from nearly 17 million to less than 10 million feet. California, Wyoming, and Oregon had each a free-use cut of between 6 million and 7 million feet. The remaining National Forest States follow with lesser amounts.

Of the timber cut under sales, Montana furnished nearly 86 million feet, or 24 per cent; Colorado 44 million feet, or 13 per cent; California 39 million feet, or 11 per cent; and Idaho 35 million feet, or 10 per cent. These amounts correspond to the following percentages of the estimated stand of National Forest timber in each State: For Montana, three-tenths of 1 per cent; for Colorado, four-tenths of 1 per cent; for California, four one-hundredths of 1 per cent; for Idaho, one-tenth of 1 per cent. In other words, the cutting is far within the growth capacity of the forests.

Reforesting of denuded land in the National Forests was pressed as vigorously as possible. Because of the expense and the great difficulties involved progress in the initial stages is slow. The watersheds which are receiving first attention are those most in need of immediate improvement for the benefit of municipal supplies or communities dependent on irrigation. About 450 acres were planted with young trees and 1,250 acres were sown with tree seed. The nurseries contained, at the end of the calendar year 1909, 7 million seedlings and transplants.

The National Forest range supported nearly 1 million more head of stock than last year—an increase greater than that made in the area under grazing control; in other words, the carrying capacity of the range under regulated grazing has advanced.

Under the cooperative agreement entered into with the Department of the Interior for the management of forests in Indian reservations, work was carried on in Washington, Oregon, California, Idaho, Montana, South Dakota, Arizona, Minnesota, Wisconsin, and North Carolina. This agreement provided that the Forest Service should take charge of all timber sales, supervise all logging, and protect against fire all forests on Indian reservations. It also provided that the Forest Service should prepare and apply plans for handling, as productive forests, all the timbered lands for which this was found to be the best permanent use. The ends sought were (1) to secure for the Indians the full value of all timber sold and (2) to safeguard and improve the forests themselves. All expenses incident to the conduct of the work were to be borne by the Indian Office, which also prescribed the policies to be followed in the employment of Indian labor, and in all other matters affecting the welfare of the Indians. Responsibility for all work in the woods was assumed by the Forest Service.

During the year 190 million feet of timber, worth over $1,000,000, was logged under the supervision of the Forest Service. Plans were prepared for the utilization by sale of much additional fire-killed and wind-thrown timber. Regulations were put into effect to prevent unnecessary waste and harm to the forests when Indians cut timber for their own use. The methods of logging on various operations in progress when the agreement was made were radically modified, to the great advantage of the Indians. Fire protection was effectively maintained in the face of unusually threatening conditions and with the saving of an immense amount of timber from destruction. The extension of the work contemplated by the agreement to all Indian reservation timber was prevented by the inability of the Indian Office to make the necessary allotment of funds.

Shortly after the close of the fiscal year this cooperative agreement was terminated.

Timbered portions of reservations were examined, plans of management prepared, or timber sales supervised for the War Department, the Navy Department, and the Department of Commerce and Labor.

Cooperation in the study of state forest problems of various kinds was conducted with New Hampshire, Kentucky, Alabama, Florida, Michigan, Oklahoma, Utah, and the Illinois state laboratory of natural history.

Forest studies in cooperation with private owners were made in 26 States, and by the Service independently in 16 States, in addition to the studies conducted on National Forests. Cooperative experiments in nursery and planting work were also made, chiefly in cooperation with state experiment stations and state foresters.

In the field of forest products important studies of present supplies, uses, markets, and prices of timber, of the natural qualities of wood and of methods of handling and treating it to secure the best service, and of wood waste and its possible reduction, were continued and developed along practical lines.

BUREAU OF CHEMISTRY.

In addition to its work in connection with food and drug inspection, the Bureau of Chemistry is engaged in numerous studies of a chemical nature, all in some way associated with the advancement of agricultural interests. Some of these have progressed so far that tangible results could be announced during the year.

Studies of sweet corn have shown that it makes little difference whether the corn is grown in a northern or a southern latitude, so far as the sugar content is concerned, although the northern-grown "roasting ears" may have greater tenderness and a longer season. Methods have been devised by which the corn after plucking may be

kept a day or longer at a low temperature and retain its flavor. These results give promise that the city consumer may hereafter have green corn almost as sweet and tender as if taken directly from his own garden.

Experiments with wheat show that soil and climate have a very important influence—perhaps a predominant influence—upon the chemical composition. For instance, seed of the Crimean variety of wheat grown in Kansas contained 20 per cent of protein, but when this seed was sown in California it yielded a crop with only 11 per cent of protein. The results of these experiments indicate that when crops are to be improved by selection it is essential that the selecting process be carried on in the locality in which the crops are to be grown.

With the view of securing information which may lead to the improvement of American wines, 110 samples of such wines were tested and analyzed, the various steps in the process of wine making as commercially practiced were observed at Sandusky, Ohio, representative samples of the juices of all the important varieties of grapes grown in that region were analyzed, and wine made by the Bureau from the leading varieties, under the most carefully controlled conditions, is now under observation. It is expected that these studies will make an important contribution to our knowledge of correct processes of wine making under American conditions.

The Bureau of Chemistry collaborated with the inspection laboratories of several cities in an effort to improve the quality of the milk furnished to the city consumers. It was found that adulteration of fresh milk was much more prevalent than had been thought. In one city the instances of watering, under the guise of ice placed in the cans to cool the milk, were surprisingly numerous. Several convictions resulted, and it is believed that the local authorities have been materially assisted in their work.

Many manufacturers have complained that the Department's standard of 28 per cent for total solids in evaporated milk is too high. This led to observations of the process of evaporation at several factories and the examination of more than 100 samples in order to test the question. This study is not yet completed.

It can now be stated that the quality of the drugs imported into this country has materially improved. When the work on drugs was begun it was rare that imported belladonna roots and leaves, for instance, were not found to be adulterated with some cheaper substances; but at present it is just as rare to find these drugs adulterated. There is still some importation of drugs which fall below the

recognized standard, however. In interstate commerce, also, a certain proportion of adulterated drugs is still to be looked for. One sample supposed to be kamala examined during the year was found to be nothing but red sand, while powdered conium and ipecac have been found adulterated with powdered olive stones.

The quality of the chemical reagents furnished the Department has materially improved during the year, owing to the rigid examination which they now undergo upon their delivery. Certain reagents, of which ethyl acetate and acetic acid are examples, are now furnished of a high grade, whereas manufacturers formerly declared that they could not be so furnished.

At the request of the Post-Office Department the Bureau of Chemistry analyzed 15 medicinal agents represented as cures for various maladies and sent or prescribed through the mails in violation of the postal laws.

Since the passage of the Food and Drugs Act the "prescription scheme" has arisen. Under this plan of selling proprietary medicines, a prescription is sent through the mails. The prescription will contain several well-known medicinal agents, but also a coined name of some unknown product. In order to fill the prescription, the recipient must purchase the agent sold under the coined name. Analyses of these products have shown that they usually consist of the cheapest and commonest of ingredients, although the advertisements would lead one to believe that the product with the coined name is new or rare, and that the remedies are panaceas for various diseases. Such remedies are plainly fraudulent, since they have no curative properties for the diseases for which they are recommended.

An investigation of the effects of acetanilid, antipyrin, and phenacetin, drugs commonly used in headache remedies of the present day, showed that the indiscriminate use of these drugs—or remedies containing them—without the advice of a physician, frequently produces poisoning, a drug habit, or, in some cases, death.

Tests of papers to the number of 1,559 were made during the year for the Government Printing Office, and 2,528 examinations of papers and leathers were made for the Post-Office Department. Besides these, 2,606 analyses were made of samples of supplies purchased on contract for the various Departments of the Government, and 5,511 pieces of apparatus were examined.

The study of paper-making materials has not yet revealed anything which can compete, under usual conditions, with rags, wood, straw, and the commonly used fibers in quality or in cost of papers made.

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A study of the spirits of turpentine found on the market showed that about 20 per cent of the samples collected were adulterated, and the average amount of adulterants present was 6.5 per cent.

In experiments on the refining of wood turpentine by steam and by destructive distillation it was found that a wood turpentine of superior quality can be thus produced, although it has not been possible to secure a sharp separation of oils having a given boiling point. These studies are being continued.

In the fall of 1908 an experimental school was organized for instruction in the art of making denatured alcohol. The school was well attended. A series of lectures was given, covering all phases of the subject and extending over a period of nearly two months. Practical demonstrations of distilling processes were given in connection with the operation of a small but well-appointed distillery set up on the premises of the Bureau of Chemistry, the chief purpose of which was experimentation in the making of denatured alcohol from waste materials of the farm. The materials tested included molasses, apples, small grain, corn, watermelons, and potatoes. Definite conclusions have not yet been reached. It seems clear, however, that the profitable utilization of waste materials of the farm will call for especial skill, and that the manufacture of denatured alcohol in a small way in this country will require the instruction of a large number of young men in the art of fermentation and distillation.

The study of deterioration of foods in storage has been continued and has been extended to include storage at ordinary temperatures as well as cold storage. The analytical methods have been perfected, and the work has been carried on with careful attention to a greater variety of detail than during earlier years.

In the study of cold-stored chickens the Department is finding cordial cooperation among all classes who are interested in the handling of poultry. In the further investigation of this subject it is planned to make a complete study of all the conditions to which a chicken may be subjected from the time it is killed until it reaches the consumer. Such a study should result in valuable additions to our knowledge of the decomposition of flesh as influenced by commercial methods, and should also prove valuable to consumers since it must result in improved food supplies.

BUREAU OF SOILS.

THE SOIL SURVEY.

During the year the soil survey was concerned in the mapping of the soils of forty-five different areas in twenty different States. As the result of detailed surveys there was completed the mapping of 24,436 square miles of area, the maps to be published on a scale of 1

inch to the mile, upon which scale an area of 10 acres has been considered the unit. In addition to this, reconnoissance surveys of large areas were completed in the Great Plains country. Westward of the ninety-ninth meridian to the foothills of the Rocky Mountains, where the soils generally are level or gently rolling, they are uniform over rather large areas, and the climatic conditions are such that, except under conditions favorable for irrigation, general and "extensive" farming must prevail for a time. It is estimated that this area contains approximately 500,000 square miles. In this region, extending from Canada on the north to Mexico on the south, I have directed that the soil survey be so made that the maps may be published on a scale of 6 miles to the inch, which is adequate to cover the needs of that country for many years to come. On this scale all of western North Dakota was surveyed and the report and map were prepared for publication. An area of 16,000 square miles in southwestern Texas was also completed, and the report and map on this area are about ready for publication. An area of about 10,000 square miles has been completed in the Panhandle of Texas, but as it is anticipated that the whole Panhandle region can be completed during the coming fall and spring the report upon this area is temporarily withheld, awaiting the completion of the survey of the entire region. The survey of the western half of South Dakota has been completed and the force will be moved into southern Texas. A total area of 76,180 square miles was surveyed in the Great Plains region, and it is expected that by the end of the present fiscal year western Nebraska, western Kansas, and the whole of the Panhandle of Texas will be completed, making almost a continuous strip from Canada to Mexico. This will leave the western half of the area to be completed, including eastern Montana, eastern Wyoming, eastern Colorado, eastern New Mexico, and western Texas.

Reconnoissance survey work is also being carried on in the Appalachian region, and by the end of the present field season practically all of western Pennsylvania will be mapped on a scale of 6 miles to the inch. This same scale of work is also being used in the cut-over pine lands of Washington, giving excellent results for large areas of fairly uniform soils in a region relatively thinly settled, and at a very much lower cost per square mile than for the more detailed work required in the Eastern States, in the irrigated areas, or on the California coast. Altogether the soil survey has mapped during the fiscal year an area of 100,616 square miles, at a total cost of about $145,000, including the field and office expenses. This makes in all for the soil survey 257,694 square miles which have been surveyed and mapped since the beginning of the work in 1899.

General interest in the soil survey work has been rapidly increasing. More and more use is being made of the data in the agricul-

tural development of the country. The precise knowledge of the soils and conditions prevailing in different parts of the country is being utilized by farmers and prospective settlers, and it is proving to be one of the great educational means for the gradual development of more intelligent and more systematic methods and agricultural practices.

SOIL FERTILITY.

A great and fundamental problem which has confronted our people, as it has the people of the world, is the question of the permanency of soil fertility. Of late years, particularly, the idea has prevailed that the soils of various parts of the United States are wearing out through loss of mineral plant food, and that a serious condition is thus presented for the future of our people. So important and fundamental is this problem for the welfare of our people that I directed a thorough examination to be made of the whole subject, and an exhaustive report has been issued, from which certain important conclusions can be given in a few words.

It has been found from the records kept by our own Department that, on the average, crop yields per acre have shown a decided tendency to increase during a period of forty years, and that there is no evidence of general decrease over large areas or in any particular State, as is popularly supposed. This indicates, undoubtedly, that on the average our people are farming more intelligently and therefore more successfully, and that we are, through these more intelligent methods, winning gradually larger returns from the soil.

It has been held, however, by some writers that even if the yields are increasing, the element of danger is that the larger crops remove larger amounts of plant food from the soils and bring nearer the time when the soils will eventually wear out. To meet this argument it has been necessary to extend the investigations into older countries, and the records of Europe have been searched for information in regard to the past history of these older countries that can be taken as a safe guide for the future of the newer soils of the United States. These records indicate that in the middle of the sixteenth century, or, roughly speaking, three to four hundred years ago, the soils of central and northern Europe were producing on the average about as much wheat as the soils of the United States are producing at the present time. These European soils have been occupied for agricultural purposes for at least a thousand years, during most of which period the country was more densely populated than the United States is at the present time. So far as records are obtainable, they indicate that as a result of increasing population and more intensive and more intelligent methods of soil control, and in spite of their longer occupation, the average yield per acre has increased, until in

the case of northern Europe the soils are now producing about two or two and one-half times as much per acre as the newer soils of the United States are producing.

In addition to this evidence of actual crop yields per acre, an exhaustive investigation has been made of all the chemical analyses which have been made of soils for the last eighteen years in certain countries of northern Europe in which crop yields have been increasing, and likewise of the soils of the United States, including the older soils of the Eastern States and the newer soils of the Western States. The results of these analyses, published side by side, show no significant difference in chemical composition between the older soils of Europe and the newer soils of the United States. Microscopical examinations of the soils fail to show that the longer occupation of the soils of Europe has changed noticeably the mineralogical character of the soils. It is reasonable to infer from the work that has been done that within historic times the occupation of the soils for agricultural purposes has failed to noticeably change the mineral character of the soil material upon which the future life of the nation must ultimately depend. The reasons for this and the laws of nature which permit the soil thus to be continuously occupied and used for mankind as freely as the air are complicated and difficult to understand, and offer a profitable field of research for our agricultural colleges and experiment stations.

While this satisfactory solution of this main question is hopeful for the nation, nevertheless individual farmers fail and individual farms run down through neglect, lack of intelligent cultivation, and lack of knowledge as to soil adaptations and methods of control. So far as can be observed at the present time, cases of failure on the farm are due to individual neglect or misjudgment. Such injury as has resulted to the soil in such cases may be remedied by change of ownership or by more intelligent methods of control, and is therefore not fundamentally due to the soil itself, but to the people who have worked the soil. This is a condition which can be improved either through force of necessity, as it has been in the case of Europe in the past, with increasing population and greater necessities, or through education and force of intellect, utilizing the advance knowledge which now prevails alike in Europe and in America.

The first lesson that our people must learn—one which is taught by the operations of the soil survey—is that we have a great variety of soil types (700 different types of soil having already been encountered in the area that has been surveyed), and each one of these soil types has its own peculiarities, its own characteristics, and its own peculiar adaptation to crops, rotation schemes, and methods of soil control. This is the great fundamental fact which our farmers must

understand: The first step in agricultural development is the knowledge of the *particular soil characteristic of the farm.*

The idea has prevailed in the past that through the use of commercial fertilizers and intelligent control all soils can be made to produce at will any crop that it is desired to grow. From a scientific standpoint this may be possible, but it can not be done at a profit. There are soils that can not be adapted commercially to wheat production, there are soils that can not be adapted commercially to fruit culture, and there are soils that can not be adapted commercially to any of our staple crops, and should remain as forest soils. The highest development of agricultural production will result from the adaptation of each type of soil to a particular line of crops, bearing in mind at all times the market requirements and the transportation facilities.

ABANDONED FARMS.

The United States has been developing for agricultural purposes an area as large as the whole of Europe, while its population is but little larger than that of any one of several European countries. So much has fashion and sentiment had to do with this agricultural development that many of the lands, particularly in the Eastern States, have been practically abandoned, so far as profitable agricultural use is concerned, by the shifting and moving of our agricultural population into new regions in which lands are purported to be cheaper and in which the advertised inducements have been proportionately large. With the rapid extension, also, of our industrial life and the opportunities offered in the past in business and in the professions, the cities have called upon the country for clear brains and vigorous bodies to such an extent that large areas have become so depopulated of active and vigorous minds and bodies that the stock is insufficient to repeople the country districts. The result has been that some of the most fertile lands in our Eastern States, some of the most fertile lands of the world, have been left in a condition of practical if not actual abandonment, and the price of provisions has increased for the simple reason that there are not enough people to actually work the soils and to raise the crops necessary to feed the nonproducing population of the cities.

The great problem which faces American agriculture to-day is the problem of the proper utilization of our soils and the development of our agricultural interests in spite of and in face of the allurements of the cities and the commercial and industrial avocations. It has now become as serious a problem to settle up our Eastern States as it has been in the past to settle the West. The first problem of all is to devise means of resettling the lands which have in recent years been neglected through the mistaken idea that they have become exhausted,

but which, it is now clearly apparent, can be brought back to an increasing production through a change in farm management and the infusion of new and active blood into the rural communities.

BUREAU OF ENTOMOLOGY.

Several important practical results have been reached by the Bureau of Entomology in the course of the year, and excellent progress has been made in all of its investigations. Certain new lines of work have also been begun.

GIPSY MOTH.

The gipsy moth has been held within the bounds established a year ago except in the State of New Hampshire. Here a number of localities have been discovered to the north of the old infested region. It is not probable, however, that the spread of the insect to these localities has been recent, but rather that they are simply points at which it has not previously been discovered. Cooperation with the state officials of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut has been continued. The force of the Bureau has continued cutting underbrush and removing deadwood and undesirable trees to a distance of 100 feet from the roadway on either side of the roads leading through the worst infested woodlands. More than 300 miles of roadway have been cleared in this manner, making it impossible for gipsy moth caterpillars to drop from trees along the roads upon passing vehicles. These strips have also been sprayed with arsenicals, and the trees have been banded with sticky paper, so as to prevent the ascending of caterpillars crawling from underbrush. The improvement in the infested territory in Massachusetts, Maine, Connecticut, and Rhode Island has been marked except in woodlands proper, and much experimental work has been carried on which indicates that eventually it may be possible to apply remedial measures in such localities.

An important step in preventing the further spread of the gipsy moth has been taken in cooperation with the different railroad corporations operating within the infested territory. Under a regulation put into effect by the railroads on July 1, 1909, shippers of lumber, cordwood, fence posts, railroad ties, and other forest products are required to present a certificate of inspection before the railroads accept the shipments. Shippers now request inspection from the Department's agents. It is thought that by this method the danger of spread in this way will be minimized, and this method of spread is considered as secondary only to the carriage of caterpillars dropping from roadside trees on passing vehicles.

IMPORTATIONS AND EXPORTATIONS OF USEFUL INSECTS.

In cooperation with the State of Massachusetts the extensive experiment in the introduction of foreign parasites of the gipsy moth and the brown-tail moth has been carried on as in previous years. An American agent was sent to Russia, the Chief of the Bureau of Entomology visited different European countries, and the different European governments as well as the government of Japan have cooperated through their official experts, while several private entomologists have also cooperated in a hearty manner. The result has been that more parasite material was received during the year than ever before. The best results have come from France and from Japan.

During the year twelve species of introduced parasites and predatory insects have been recovered from the field, indicating a reasonably certain establishment in this country. The close of the year finds twice as many species of introduced parasites in the field as were present last year. Many of them have scattered over extensive areas, one species having been found over an area of 500 square miles. It is hoped, by the continuance of the same and improved methods, that this number will be increased during the present year.

News has been received from Italy that American parasites of the mulberry scale insect sent to that country in return for similar favors to this Government have established themselves in certain regions in such numbers that the danger from the scale is considered passed. Certain ladybird beetles have been sent by the Department to Malaga, Spain, for the purpose of preying upon a species of mealy bug. Parasites of scale insects have been sent to Peru. A species of tick parasite occurring upon the dog tick in Texas has been sent to South Africa. The exportation of bumblebees to the Philippine Islands for the purpose of fertilizing clover is reported to have been measurably successful, and American bumblebees have been found in certain regions in the Philippines during the year.

MEXICAN COTTON BOLL WEEVIL.

The work conducted by the Department against the Mexican cotton boll weevil has been followed up in much the same way as in previous years. The crop of 1908 was damaged to the extent of about $30,000,000, the loss in Texas being light compared with that in Louisiana and a small portion of the State of Mississippi that has been invaded. The lesser loss in Texas, however, was due to abnormal weather conditions. The great loss in Louisiana is a verification of the prediction made for several years, and it indicates the importance of means of control adapted to such conditions as are found in Louisiana and other States that will soon be invaded by

the weevil. The insect enemies of the boll weevil have come to be of great importance, and examinations made to determine the mortality rate due to this cause have indicated that in one case 77 per cent of the boll weevils in a field in Louisiana were being destroyed by their insect enemies, and at various points in Texas 21 to 48 per cent were killed in the same way. It is evident that the extent of control secured in this way is greater than that by any artificial means. It has been found feasible to make certain changes in the planting and cultivating systems that will greatly facilitate the work of the natural enemies of the weevil. Experiments in the introduction of parasites from one region to another have been measurably successful. Methods of planting, varieties planted, spacing, and methods of cultivation and harvesting all have a bearing upon control by parasites. Each one of these features has been investigated. The subject is an extremely complicated one, and will require additional work for several years. The chain drag mentioned in my last Report has been used with success, and its use has been found to have an important cultural effect upon the crop, in addition to its usefulness as a weevil destroyer. Special studies have been made in the Mississippi Delta, where conditions differ to a considerable degree from those in any other region invaded by the weevil. The heavy precipitation, presence of heavy timber, mild winters, and other features combine to make the boll-weevil problem more serious than it has been elsewhere, and especial work has been carried on for the purpose of ascertaining any changes in the life history of the weevil due to these differing conditions.

INSECTS DAMAGING FORESTS.

A study has been made of the white-pine twig blight in New Hampshire to determine the relation of insects to the several forms of blight. A study has been made of the injuries by insects to storm-felled pine timber in the South, in which it has been shown that a large percentage of this loss can be prevented. Investigations of insect depredations in private forests of northern California have been carried on, in which much valuable information was accumulated on which special recommendations to the owners were based, and an investigation has also been made of the relation between injury by sulphur fumes in smelting centers to the timber on private lands near by and subsequent injury by insects. Investigations and practical demonstration work have been continued in regard to the insect damage to hardwood products with gratifying progress. Co-operation in control demonstrations with private forest owners, state forests, and National Forests has been begun in several instances, and this line opens up promising possibilities. The practicability of controlling the Black Hills beetle, the most destructive enemy of pine

timber in the central Rocky Mountain region, has been demonstrated during the year on a large private estate and the adjoining Pike National Forest in Colorado. It has been shown that this control can be exercised not only with economy, but actually at a profit above the cost.

INSECTS DAMAGING DECIDUOUS FRUITS.

PEAR THRIPS.

The results from the work on the pear thrips in California during the fiscal year were admirable, and the investigation has been eminently successful. Full studies of the life history of the insect were made, extensive experiments in all directions were carried on, and, with a basis of accurate life history knowledge, the substantial control of the insect has been accomplished. Early experiments in deep plowing of the soil during the summer to destroy the larvæ of the thrips, which at this period are all beneath the surface of the ground, gave practically negative results, since the larvæ are active at this period and are quickly able to construct new cells in which they live undisturbed. In the fall, however, it was discovered that deep plowing and cross plowing, with harrowing after the first rains, was very effective. At this time the insects are mainly in the helpless pupal stage, and are very susceptible to any disturbance. In two orchards in the Santa Clara Valley where this method was thoroughly tried there were killed, respectively, 70 and 73 per cent of the insects. This process also puts the soil in better condition to retain the water from the winter rains and brings about a more vigorous condition of the trees. More than 70 per cent of the insects being destroyed by this process, it has been found that from 90 to 97 per cent of the remainder may be killed by proper spraying, under high pressure, in a downward direction, with a combination spray of a diluted tobacco extract and distillate oil emulsion. Demonstration work resulted in the protection of the blossoms and the production of a full crop in orchards in which for some years practically the whole crop had been destroyed. The problem, therefore, is solved, and with a few additional demonstrations the handling of the pear thrips can safely be left to the orchardists.

CRANBERRY INSECTS.

The work on cranberry insects has been continued and enlarged. Owing to conditions which render flooding of bogs of questionable safety, especially in midsummer, in Wisconsin, attention has been largely devoted to sprays. Demonstration experiments in spraying have been carried on in different portions of the cranberry marshes in the Cranmoor district of Wisconsin, and have shown uniformly good

results. Combination sprays of Bordeaux mixture and arsenate of lead have reduced injury by the fruit worm from 60 per cent down to 14 per cent, which means an equivalent in money gain of about $86 per acre.

OTHER INSECTS DAMAGING DECIDUOUS FRUITS.

Extensive tests in different parts of the country have been made with the one-spray method advocated in the Northwest against the codling moth, and demonstration sprayings for the codling moth and apple diseases have been carried on in cooperation between the Bureau of Entomology and the Bureau of Plant Industry in several States. Further observations have been made concerning the work of the codling moth in pears, a difference in treatment between pears and apples seemingly being demanded in California. Work on the grape root worm has been carried on, and it has been found to be practicable to protect young vineyards from further injury by a system of spraying and cultivation, and also, by a schedule of treatment including pruning, cultivation, spraying, and the use of fertilizers, to restore to excellent bearing condition old vineyards so badly injured by the root worm as to have become unprofitable. Studies have been made of the question of arsenic accumulations in soils, in sprayed woodlands, orchards, and vineyards, and much work has been done on investigations of orchard insecticides.

FIELD CROP INSECTS.

The work on field crop insects has been largely devoted to the green bug, the joint worms, and the Hessian fly.

THE SO-CALLED "GREEN BUG."

This insect was practically absent from most of its range until the early fall of 1908, on account of its great reduction in numbers by natural enemies, but studies were continued in which it was found that this insect has twenty-five native food plants and a number of parasites hitherto unknown. Moreover, a knowledge has been gained of just when and under what conditions the parasites of the "green bug" can be depended upon to prevent an invasion, and what the farmer must do himself to reduce the severity of the invasion. Some local outbreaks occurred in the spring of 1909, and investigations have shown that the farmer can do much to protect himself by preventing the growth of volunteer grain in fields intended for fall wheat or oats, and by delaying the sowing of these crops as late in the fall as possible, the object being to prevent the pest from becoming established in the fields until as late a date in the fall as possible.

JOINT WORMS.

Careful studies in the Northwest of the damage by the wheat straw worm indicate that its injuries can be prevented by cultural methods, namely, by rotation of crops, clean, early summer fallow, and the temporary abandoning of spring-wheat culture in the infested regions. Studies of the true joint worm in Ohio, Indiana, and Illinois, where a serious outbreak has occurred, indicate that late seeding of wheat, in connection with rotation of crops, tends to reduce its injuries.

HESSIAN FLY.

The wheat-sowing experiments started in Kansas in 1907 have resulted in the gaining of information whereby a threatened outbreak in 1909 was practically avoided, owing to a campaign of late sowing based on these results, instituted and followed up by the state experiment station, the agricultural press, and millers, grain dealers, and, in one instance, by a church organization. It is estimated that the wheat-sowing experiments in Kansas resulted this year in the saving of $500,000 or more.

INSECTS INJURIOUS TO VEGETABLE CROPS.

Work on truck crop insects has been carried on on a larger scale than ever before in tidewater Virginia, in south Texas, and in Florida, and much additional practical information concerning insects of this class has been gained. Work has also been done upon sugar-beet insects in California and other portions of the West.

INSECTS AFFECTING CITRUS FRUITS.

WHITE FLY.

The investigation of the white fly in Florida has been continued with the purpose in view of placing every practicable manner of control on the best possible basis. During the fiscal year life-history studies and fumigation experiments were practically concluded, and experiments with contact insecticides were taken up again, after having been discontinued temporarily to allow for the conclusion of the fumigation experiments. Experiments with fungous parasites of the white fly were continued with much progress, and the study of trap foods has been taken up. The discovery of another injurious species of white fly of citrus fruits in Florida has made necessary comparative studies of life history, economic importance, and control, although this second species is fortunately more easily controlled than the first. Fumigation experiments were conducted on a large scale in cooperation with several orange growers, and a number of practical points in fumigation have been brought out.

HYDROCYANIC-ACID GAS FUMIGATION IN CALIFORNIA

This work has been continued along strictly economic lines, with the primary object of increasing the efficiency of fumigation as well as of reducing its cost. The results have already practically revolutionized the old wasteful procedure, which possessed none of the elements of uniformity. The entire practice of fumigation has been rapidly standardized. Before the next season closes it is prophesied that practically all fumigating outfits in southern California will be working under the standard system devised by the Bureau of Entomology, and it seems probable that, after the general adoption of the system, a single treatment every second year will accomplish the same results as an annual treatment, thus giving an annual saving of from 30 to 50 per cent of the present cost.

ORANGE THRIPS.

A new insect enemy of the orange has become prominent in portions of California, especially in an important and rapidly developing orange district. This insect punctures the rind of the newly set fruit and of the older fruit, bringing about a scabby or russety condition, largely reducing its value. Tender foliage is also severely injured, especially the foliage of nursery stock. This is a new investigation and was begun only in April, 1909, so that it is too early as yet to announce results.

INSECTS WHICH CARRY DISEASE TO MAN AND DOMESTIC ANIMALS.

Work on mosquitoes has been carried on actively, as during the last ten years, and yet during the year new points of practical value have been brought out. It has been discovered that a large part of the mosquito supply of otherwise well-conditioned portions of large cities is sewer-bred, and that malaria-bearing mosquitoes in dry summers will breed in the sewer traps, making it extremely important for the health officials to treat all sewer traps with kerosene or some other "culicide." Work on the house fly has been continued, and a bulletin on this insect and other disease-bearing insects has been published, which has attracted still further attention to this unnecessarily dangerous pest. The crusade against the house fly, indicated in my last annual report, has become during the fiscal year of almost a national character. So many boards of health have taken it up, and so many civic organizations have turned their attention to this subject, that the whole country may be fairly said to have been aroused.

TEXAS CATTLE TICK AND OTHER TICKS.

Observations on the habits and life history of the Texas cattle tick have been carried on in continuation of the work under way during

the preceding year. Special attention was devoted to the determination of the points in life history that are of importance in the various systems of control depending upon the transference of cattle from one pasture to another. This work is of great importance to ranchmen in the area that will not be reached for some time in the plan of total eradication now being so successfully conducted by the Bureau of Animal Industry. Demonstration experiments in cooperation with ranchmen have been successfully carried out. Tests of the possibility of the carriage of Texas fever to other animals have been made, and studies have been made of other ticks which may be agents in the dissemination of diseases of other domestic animals. A considerable amount of work was also done on the tick which transmits the so-called spotted fever of human beings.

INSECTS INJURIOUS TO STORED PRODUCTS.

Several insects of this class have attracted much attention during the year, and investigations begun in 1908, at the request of many milling companies in Kansas, Oklahoma, Missouri, and Texas, and of steamship owners and operators in Texas and Louisiana, have been continued. Special attention has been given to the flour beetles and to the important question of determining the place or places at which export flour from the different States mentioned becomes infested, whether chiefly at the mills, or in Galveston, or at New Orleans, or on the cars, steamships, or on wagons used in carting material from the mills to the carrier. There is no doubt that infestation occurs at all of these points, but it is feared that in some cases primary infestation begins at the milling establishments, although some of the mills which have been investigated are kept scrupulously neat and are thoroughly fumigated at least twice yearly. More attention has been paid to the Mediterranean flour moth than to any other insect of this class. This seems to be the most serious mill pest in the world. Investigations by the Bureau of Entomology indicate that fumigation of milling establishments with hydrocyanic-acid gas is the most perfect remedy. Bisulphid of carbon is less effective, as a rule, and the same may be said of sulphur dioxid.

INSPECTION WORK.

As in previous years, the plant material introduced by the Bureau of Plant Industry has been inspected before shipment throughout the country. In January, 1909, it was discovered that winter nests of the brown-tail moth were occurring extensively on shipments of apple and pear seedlings coming to the United States from portions of France. Investigations showed that these winter nests had been found upon seedlings so imported in many different parts of the

country. Warning letters were sent to different state entomologists, and the customs officials of the different ports of entry were directed by the Secretary of the Treasury to inform the United States Department of Agriculture immediately upon the arrival of any nursery stock from abroad, and the principal railroads were notified of the danger of carrying such plants. As a result, not only the customs officials but also the railroads promptly notified the Bureau of Entomology of the ultimate addresses of all cases of plants received, and in this way the Bureau was enabled to notify state inspectors and other competent persons, and to employ inspectors in the States not provided with inspection service at the points of ultimate destination, and to secure inspection and the destruction of infested plants. Notifications of 800 shipments, divided among 35 different States, were sent out, and it is probable that all, or practically all, of the imported nests were destroyed.

BEE CULTURE.

The work on bee diseases has been continued. Samples have been received from many parts of the country, and the information gained from this work has been of great value, especially in the way of giving information to state legislatures which are contemplating the passage of laws providing for a much-needed inspection of apiaries. Notifications of the nature of bee diseases, especially in cases of new outbreaks, have been of much value in preventing their further spread. New studies have been made of the structure and development of bees, of their activity, of the status of bee keeping, and, in cooperation with the Bureau of Chemistry, the Bureau of Entomology has begun work in wax analysis.

OTHER INVESTIGATIONS OF INSECTS.

The work on tobacco insects has been continued with practical results of value. It is hoped that this work can largely be completed during the coming year. Studies have been made of insects affecting the pecan, as well as of many kinds of insects injurious to shade trees and ornamental plants. A large amount of work has been done on scale insects, and the Bureau of Entomology is making an effort to inform itself concerning the scale insects of the entire world, since these insects are especially liable to introduction from one part of the world to another.

BUREAU OF BIOLOGICAL SURVEY.

The essential basis of the work of the Biological Survey is the study of American birds and mammals in their economic relations. Many of our mammals and a few of our birds are seriously destruc-

tive, so that accurate knowledge of the food and habits of such pests and of effective means for reducing their numbers and preventing their ravages is becoming more and more necessary to profitable agriculture and stock-raising. Almost as important is a widespread knowledge of the part our useful birds and mammals play in aiding the farmer; for it is an undoubted fact that, taking the country as a whole, the number of our game and insectivorous birds and of our useful mammals may be augmented with great advantage to the farmer.

The constantly increasing number of sportsmen and the growing demand for game for food partly explain the relative scarcity of game birds and mammals, while the destruction of forests, the encroachment of civilization on the homes of wild birds, and their destruction by predaceous mammals, especially cats, and for ornamental purposes, go far to explain the diminished number of many kinds of useful birds. The public must have a thorough understanding of the important part birds and certain animals play in checking the increase and spread of noxious insects before present conditions can be improved. Much may be done through the education of the young, especially the pupils in our public schools. By the distribution of publications containing the essential facts in regard to the habits and food of birds, the Biological Survey seeks to aid materially in this educational work. It is gratifying to be able to state that the demand for this kind of literature on the part of educators is constantly increasing. Nor are evidences wanting that a fuller comprehension of the services rendered to agriculture by birds and mammals and of the means necessary to protect and encourage them is already bearing fruit.

HOUSE RATS.

Although from very remote times rats have been recognized as pests, it is only recently that their extermination has assumed international importance. Investigations in many parts of the world reveal the fact that everywhere the losses occasioned by these mischievous rodents are enormous. House rats appear to be constantly increasing, and the discovery that they convey the germs of disease, especially plague, from place to place and from port to port, renders their destruction highly important.

While in several countries, notably England, Denmark, and parts of the United States, vigorous efforts have been made to exterminate rats, or to materially lessen their numbers, the results thus far attained are not reassuring. The rat is exceedingly wary and difficult to destroy, and is very prolific. Except where funds are practically unlimited, and cooperation possible on an extensive scale, the check

to increase is only temporary, and in a few months after efforts have relaxed the rodents are as numerous as ever. The true remedy for the rat pest therefore lies in prevention rather than cure. The rat pest has its origin chiefly in cities, especially seaports, spreading thence to smaller towns and to the country. Hence it may be most effectively dealt with through municipal ordinances. As a measure of first importance the rat-proofing of all buildings within city limits should be rigidly enforced. Such ordinances when supplemented by the withholding of food from the rodents would go very far indeed toward finally abating the evil.

The present most important source of food supply for rats is garbage of various sorts, especially kitchen refuse. Immense numbers of these rodents are fed in the back yards and alleys of cities. The storage of household garbage in closed containers, which should he frequently and systematically emptied, is, therefore, an absolutely necessary supplementary measure, as also the protection of all sorts of forage, much of which is now loosely stored and easily accessible to rats.

If rats are denied harborage in dwellings, markets, stores, stables, and public buildings—the expense for which will be but a tithe of the loss they now cause, directly and indirectly—and if the present abundant food supply can be withheld, not only will their numbers be materially lessened, but the use of traps and poisons will be made vastly more effective than now.

The Biological Survey has continued experiments with various kinds of traps and baits, and also with poisons, and has published a useful bulletin on the subject, which may be had on application.

Requests are constantly received from all parts of the country for information as to the effectiveness of bacterial preparations for destroying rats. A number of these preparations have been put on the American market and widely advertised, and during the year tests have been made with several of them. When fresh and virulent, such preparations may usually be relied on to kill most of the rats which eat infected baits. The experiments fail to show, however, that the disease set up is in any sense contagious. On the contrary, it is confined to the individuals eating the baits. To some extent bacterial diseases may be communicated from dead rats to live ones, when rats that die from the disease are eaten by their comrades. Infection in this way, however, occurs on too small a scale to add materially to the effectiveness of the preparations. Thus more or less uncertain of action, limited in effectiveness, and costing so much as to make their use on a large scale practically prohibitive, none of the bacterial preparations thus far tested can be recommended to the public.

COOPERATION WITH THE PUBLIC HEALTH AND MARINE-HOSPITAL SERVICE.

A report on the conveyance of disease-producing bacteria by rats is now in course of preparation by the Marine Hospital Service, and in response to a request from the Surgeon-General the Biological Survey furnished three chapters on the following subjects: Natural History of the Rat; The Rat as an Economic Factor; Natural Enemies of the Rat. By request, also, a circular concerning the range and habits of the California ground squirrel, together with directions for poisoning the animals, was prepared by the Biological Survey and published by the Marine-Hospital Service.

CALIFORNIA GROUND SQUIRREL.

Among our more destructive rodents are the ground squirrels, which annually take a toll of $10,000,000 from the farmer. But the economic aspect of the case is quite overshadowed by the recent discovery by the Marine-Hospital Service that, like rats, ground squirrels in California serve as active agents in the distribution of plague. In one county 175 squirrels were found on examination to contain the germs of this dreaded disease, and they form probably only a small percentage of the whole number infected within the limits of a single county. Several cases of plague in man have developed as the result of bites from fleas harbored on squirrels. Thus the war against ground squirrels ceases to be merely of local interest and becomes of national moment. The extermination or reduction to comparatively insignificant numbers of the California ground squirrel, important before, is absolutely necessary if plague is to be stamped out in the United States, and only the most vigorous and persistent measures can be successful.

During the past year the Biological Survey has done much experimental work, on which it is still engaged, for the purpose of ascertaining cheap and effective methods of destroying these animals on a large scale. A formula for poisoning squirrels with barley and strychnine has been found which seems to meet the requirements better than any yet tried. The aim should be the complete extermination of ground squirrels over certain areas, especially those contiguous to seaports and other towns where the squirrels are likely to come in contact with plague-infested rats. The extermination of the animals over the whole of their present range in California, especially in the mountains, is quite impracticable under present conditions because of the great expense.

Even to diminish the number of ground squirrels in the farming districts at large to a point where the damage to crops may be disregarded will require the active cooperation of all the landowners, and this is difficult to secure, especially when large tracts of pasture

land are under one holding. Such lands, if neglected, constitute nurseries from which adjacent lands which have been cleared of squirrels are soon repopulated, thus making the warfare a never-ending one. The suppression of the ground squirrel and other rodent pests in California, however, within a reasonable period should be greatly facilitated by the recently enacted state law declaring it the duty of landowners or lessors of rodent-infested lands to abate the evil, and on failure to do so conferring on boards of health the power to declare such places public nuisances.

The Biological Survey aims to aid in the suppression of the rodent plague in every way possible, and, so far as funds are available, will, when requested, send skilled assistants to infested localities to demonstrate the best methods of ridding land of squirrels and other rodents.

PRAIRIE DOGS.

Over large areas of the Plains regions and adjacent lower slopes of the mountains prairie dogs exist in great numbers, and wherever they occur in large colonies they are a pest, being very destructive to alfalfa, grain, and other crops. Even on lands devoted solely to pasturage they are a serious pest, since a few hundred of the little animals will consume as much grass as a cow. As their colonies often extend for miles and number hundreds of thousands, the quantity of grass devoured by their combined numbers is very great. An effective formula for poisoning prairie dogs was worked out some years ago by the Survey and is now being used by the Forest Service in ridding lands within and contiguous to the National Forests. Further investigations were begun last year, and are still being carried on, to discover a still more effective and cheaper formula for destroying the animals. It is easy at moderate cost to absolutely exterminate small isolated colonies, but when thousands of acres are to be freed from the pests the cost becomes an exceedingly important item.

LIME AND SULPHUR WASH AS A REMEDY FOR THE RABBIT PEST.

During the last year the lime and sulphur wash, which for a number of years has been employed to prevent damage to trees by the San Jose scale, was tried with great success in several localities as a protection for orchard trees against the attacks of rabbits. The remedy is cheap, and as a rule a single treatment in the fall appears to protect trees for the entire winter. Its more extensive use is recommended.

FIELD MICE.

No infestation of an agricultural area by field mice at all comparable in magnitude to the invasion of certain alfalfa districts of Nevada in 1907–8 has occurred during the last year. These little

rodents are, however, numerous and widespread over the United States, and the damage they do to garden, truck patch, orchard, and alfalfa field reaches annually a large aggregate in dollars and cents.

During the year many letters have been received from various parts of the country asking for measures of relief from these pests. In response, literature has been disseminated describing the best methods of reducing their numbers. It is urged that much may be done by systematically clearing up the neglected corners of fields and waste places along roads, by which means favorite hiding places of the mice are uncovered and the animals exposed to the attacks of their natural enemies, especially to birds of prey. Concerted action on the part of orchardists and farmers in cleaning up waste places and the putting out of grain poisoned with strychnine once or twice a year will so reduce the numbers of mice that all danger of mouse invasions on a large scale will be removed, and the damage by the pests reduced to comparative insignificance.

THE MUSKRAT.

Our fur-bearing animals are constantly diminishing in numbers, and the cost of furs is constantly increasing. Hence the importance of preserving the present supply and of increasing it in every way possible. Though muskrat fur is by no means of first-class quality, it serves many important purposes, and because of the availability of its fur, its abundance, and wide distribution, the muskrat ranks to-day among our most important fur bearers. Moreover, its food habits, adaptability to varied conditions, and fecundity are such that if proper closed seasons are established so as to permit the animal to breed undisturbed, the muskrat will yield a large annual crop of furs and yet maintain existence indefinitely, even in populous regions. It is believed, too, that on our Atlantic coast there are many tidal marshes of considerable extent which can be utilized as natural muskrat breeding grounds, with larger pecuniary returns than from any other industry. It is of interest to note that not only is the flesh of the muskrat edible, but when properly cooked it is well flavored and is relished even by epicures. During the winter months it finds ready sale in the markets of several of our larger eastern cities under its own name or under that of marsh rabbit. During the past season the habits of the muskrat have been studied with reference to the value of its fur, the proper time for trapping, protective laws, and the suitability of its flesh for food, and a bulletin on the subject has been prepared for publication.

PROPAGATION OF BIG GAME.

The possibilities of growing venison for the market and of propagating deer, elk, and other large mammals within preserves has con-

tinued to receive the attention of the Survey. It is now well known that our native deer are well adapted to semidomestication, and their growing scarcity emphasizes the need of efforts to increase their numbers. The favorable reception by both farmers and sportsmen of a bulletin on Deer Farming attests the growing interest in this phase of game protection.

RELATION OF BIRDS TO FRUIT RAISING.

Birds frequent orchards chiefly for two reasons—to seek the insects that prey on fruit and fruit trees, and to feed on fruit. Fortunately the birds that are seriously destructive to fruit are few, while the greater number resort to orchards in the interests of the fruit grower. A careful study of California birds in relation to fruit raising has been in progress for several years, chiefly for the purpose of ascertaining the exact nature of the food of orchard birds and of informing orchardists how to discriminate between friends and foes, that they may encourage the one class and prevent or lessen losses from the other. The first part of a report on the subject was issued in 1907 and widely distributed throughout the State. The second and final part has been prepared and is now ready for the press. These investigations are being continued in Oregon and Washington, in both of which orcharding is an important and growing industry.

DUCKS AND SHORE BIRDS.

Investigations in regard to the food of wild ducks, begun several years ago, were continued, with particular reference to the transplanting from one part of the country to another of aquatic plants relished by waterfowl. By stocking the ponds and waterways, now practically untenanted by waterfowl, with wild rice, wild celery, and certain other favorite food it is believed that the number of ducks and geese may be materially increased, especially now that the strict enforcement of state game laws is generally recognized as essential to the continued existence of our waterfowl.

GEOGRAPHIC DISTRIBUTION OF WILD ANIMALS AND PLANTS.

It is well known that wild animals and plants are distributed in zones or belts which are characterized by certain peculiarities of temperature, rainfall, and exposure.

The general zone map of the United States on a small scale, with list of crops best adapted to the several zones, was issued in 1898 and has served a useful purpose, as shown by the extensive demand for it.

Work in relation to the life and crop zones of several of the States was pushed and much progress made during the year. The study of the life zones of California is now well advanced toward

completion, especially in the southern part of the State. Field work in Colorado has been completed, and the results will soon be ready for publication. Field work in New Mexico also is finished, and a report will be prepared for publication as rapidly as possible. Considerable progress was made in field work in Arizona and Utah, but more remains to be done before reports can be completed. Reconnoissance work was carried on in Virginia, West Virginia, Tennessee, Georgia, Alabama, Mississippi, North Carolina, Kentucky, and Louisiana.

Knowledge of the geographic distribution and habits of animals formerly considered of little interest save to naturalists is fast growing in practical importance as the facts become known as to the true source and means of distribution of certain diseases. Some wild mammals, as rats and ground squirrels, are now known to be subject to some of the worst diseases which afflict man, and to spread them by harboring the insects which transmit them from host to host. Other species, now classed as harmless, may in future prove to be anything but harmless. The mapping of the ranges of wild animals, with special reference to species of economic consequence, is regarded as one of the most important duties of the Biological Survey, and this work is being prosecuted as rapidly as funds permit.

Revisionary technical studies of the rabbits and white-footed mice were completed during the year, and form the basis for more intelligent economic studies in these groups.

GAME PRESERVATION AND INTRODUCTION.

The preservation of our game and birds, though growing more difficult with increasing population, is making satisfactory progress. Each year brings a clearer understanding of the need for protection and for improvement in state laws. The hunting-license system, whereby a fund is provided for enforcing laws and restocking covers, has grown steadily in favor, and is now in operation in all but one or two States. Refuges where game may breed in security, to overflow into neighboring regions, are rapidly increasing in number, and the practice of caring for game in severe winter weather is spreading.

A similar awakening is manifest as regards nongame birds. The American farmer is well acquainted with the efficient service birds render in protecting his crops, and is strongly supporting the movement looking to the preservation of his winged allies. The millinery trade now makes little use of our native birds, but the destruction of plume birds in other parts of the world is enormous, and before long the United States will probably be asked to cooperate with other nations in its suppression.

IMPORTATION OF BIRDS AND MAMMALS.

Although the importations of birds and mammals (exclusive of ruminants and swine) aggregate nearly half a million, inspection is so thorough that the danger of the introduction of pests is practically eliminated. Two or three minor violations of the law came to light during the year and were promptly dealt with. The main interest in these importations attaches to the number of game birds imported. Nearly 30,000 gray partridges (commonly known as Hungarian partridges) were brought from Europe for liberation in the United States, chiefly in California, Connecticut, Illinois, Indiana, and Kansas. This is an advance of more than 400 per cent over last year's importation of these birds, which was more than 100 per cent above that of 1907. This remarkable increase indicates the growing tendency to apply the proceeds from hunting licenses to restocking covers. Only 1,200 pheasants were imported for this purpose—about as many as were brought in for aviaries.

Experiments in stocking preserves by means of eggs imported from Europe were continued, chiefly by one preserve owner in North Carolina, and 5,050 eggs of pheasants, partridges, and wild ducks were imported.

INTERSTATE COMMERCE IN GAME.

Even with the hearty support lent by sportsmen to modern game-protective measures, one of the most difficult problems in game preservation is the suppression of illegal traffic in game. A few cases of violation of the Lacey Act were taken up. Out of 9 reported to the Department, 4 resulted in conviction, 2 were settled out of court, and the remaining 3 are still pending. An important case, involving the shipment of 512 quail from Oklahoma to Chicago, which has been pending since 1905, was concluded, and the defendant was fined $400.

It has been extremely difficult to deal with these violations in the past, but two events of the year have removed some of the obstacles. The federal law has been greatly strengthened by the passage of the criminal code, and Illinois and Missouri, in both of which States there is considerable trade in game, which centers largely at Kansas City, St. Louis, and Chicago, have greatly improved their statutes, thus strengthening the federal law, which rests on state legislation. Hereafter it will be easier to deal with violations of the law, though supervisors at a few central points, for which no provision is at present made, are essential to full enforcement of the law.

BIRD RESERVATIONS.

The setting aside of government lands, of little or no agricultural value, for bird reservations (sanctuaries where colonies of birds may

breed safely or take refuge during migration) has proved an important means of increasing bird life, and during the year the number of such reservations was more than trebled, the increase being from 16 to 51. Some of the new reservations differ in character from those previously established. Two in Oregon, on Klamath and Malheur lakes, and one in Alaska, at the delta of the Yukon, comprise considerable areas of marsh land that form breeding grounds of wild fowl. Another, which embraces several of the western islands of the Hawaiian group, covers 5° of latitude and 21° of longitude and contains one of the largest and most famous breeding colonies of sea birds in the world. Others consist of reservoir sites of reclamation projects; these artificial lakes in arid regions will doubtless attract many birds, which in future will be protected.

Apart from their value in increasing bird life, these sanctuaries have an important educational value already being utilized, notably on Tortugas Keys Reservation. There, under the direction of the Carnegie Institution, an investigation of the life history of sea birds has been conducted, and problems of migration, the homing instinct, and other features of bird life have been carefully studied. The first results of this work were published this year by the Carnegie Institution.

GAME REFUGES.

The 20,000-acre national bison range on the Flathead Indian Reservation in Montana will soon be ready for occupancy, and the American Bison Society has already raised $10,500 for the purpose of stocking it with buffalo.

The summer range of the Roosevelt elk, which comprises the higher summits of the Olympic Mountains in Washington, was set aside as a national monument by executive order, issued on recommendation of this Department.

PROTECTION OF GAME IN ALASKA.

Many persons availed themselves of the privilege accorded by the new Alaska game law of shipping trophies out of the Territory prior to September 1, 1908, and the shipments included nearly 175 heads and horns of moose, caribou, and mountain sheep. A few trophies have since come out under license, and the Department has issued permits for the export of 81 specimens, chiefly heads and horns of the above-named species for exhibition at the Alaska-Yukon-Pacific Exposition at Seattle.

COLLECTION AND PUBLICATION OF INFORMATION CONCERNING GAME.

Careful investigation has been made during the year of the present distribution of big game, especially deer and antelope, and the num-

ber killed during the hunting season. East of the Mississippi (omitting New Hampshire, Georgia, and North Carolina) 60,000 deer were killed last season. Antelope are still found in 14 Western States, though the total number is approximately only 17,000. Notwithstanding the fact that the antelope is protected throughout the year in practically all the States in which it now occurs, special efforts are necessary to save this fine game animal from extinction. In the decade from 1898 to 1908 the antelope of Colorado, according to estimates of the state game warden, decreased from 25,000 to 2,000.

Statistics have been gathered concerning private and public game preserves, game propagation, hunting-license receipts, and many other special features of game and bird preservation.

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

As the Division of Accounts and Disbursements is charged with the auditing and payment of all accounts and claims against the Department, including the administrative examination of the accounts of the Forest Service, and the clerical work required in the proper performance of these duties is directly proportional to the amount of the annual appropriations involved, the routine during 1909 has been somewhat heavier than during any previous year, the 1909 appropriation for the Department being considerably larger in amount than that for 1908 or other preceding fiscal years.

During the year there were received, audited, and paid 56,288 accounts, amounting to $9,359,808.97, exclusive of approximately 32,111 accounts of the Forest Service, which received an administrative examination and audit in the division. Of these accounts, moreover, 3,712 were so-called "combined" accounts, in connection with which there was probably a saving of at least 22,272 checks, to say nothing of the saving of other clerical labor in connection therewith. There were also audited and sent to the Treasury for payment 2,518 accounts. In the payment of the accounts settled directly by the Division of Accounts it was necessary to draw 107 requisitions on the Treasury and subtreasuries, and issue 108,886 checks. There were issued during the year 20,636 requisitions for supplies, 4,101 letters of authorization for travel, 24,687 requests for passenger travel, 1,201 requests on the Quartermaster-General for the transportation of government property, and 1,626 department bills of lading, while 75,750 letters were written or received in the ordinary transaction of business.

With the steady increase in the appropriations from year to year, the special and annual fiscal reports required by legislative enactment have increased both in number and complexity, and as the Division of Accounts is required to superintend and direct their

preparation its duties have been materially increased thereby in this direction also, particularly in connection with the annual estimates of appropriations, the annual report of expenditures, the annual report of traveling expenses of employees stationed in the District of Columbia, and the comparative three-year report of expenditures.

By the terms of the agricultural appropriation act for the fiscal year 1909, moreover, there was imposed upon the Chief of the Division of Accounts and Disbursements the additional duty of acting as administrative officer of the fiscal affairs of the Department. In compliance with this provision of law and additional instructions from the Secretary, the disbursing officer has, at stated intervals during the fiscal year 1909, conducted inspections of the property and financial records kept by the several bureaus of the Department. A plan for the keeping of these records in a uniform manner has been devised and applied throughout the Department as far as practicable, and the system inaugurated has done much to simplify the financial transactions between the several bureaus and the disbursing office.

To carry on the work of the Department of Agriculture during the fiscal year ended June 30, 1909, Congress appropriated the sum of $16,063,106, an increase of $2,940,066 over the preceding year. Of this appropriation $11,355,106 covered the ordinary expenses of the Department, $3,000,000 the permanent annual expense for meat inspection, $1,248,000 the agricultural experiment stations, and $460,000 the printing and binding done under the Public Printer.

The disbursements of the Department for the fiscal year 1909 amounted to $14,610,295.64 and the greater part of the balance of $1,634,024.55 will be required for the settlement of outstanding liabilities. The apparent excess of disbursements over the appropriations for this fiscal year is due to unexpended balances, amounting to $181,214.19, brought forward from "Administration, etc., Forest Reserves," and other special appropriations.

The amount paid for rent of buildings in the District of Columbia for the several branches of the Department was $70,245.

All accounts for the fiscal year 1907 having been settled, the unexpended balance of appropriations for that year, amounting to $1,200,165.81, was covered into the Treasury on June 30, 1909. The account for the fiscal year 1908 is still open.

The amount estimated for the fiscal year 1911 in the annual estimates for the regular appropriation bill is $13,377,136, which includes $720,000 for agricultural experiment stations. In addition there will be a permanent appropriation of $3,000,000 for meat inspection, a permanent appropriation of $720,000 for additional allotments to agricultural experiment stations under the Adams Act, and $460,000

for printing and binding to be done under the Public Printer, making a grand total of $17,557,136.

In the estimates for 1911, $397,500 additional is requested for the protection and use of 26,528,439 acres which were added to the national forests during the fiscal year 1909, at too late a date, however, to enable Congress to provide therefor in the agricultural appropriation act for 1910; while in the Division of Publications the amount requested for labor-saving machinery and photographic equipment for 1911 is $2,400 less than the amount provided for 1910, and in the Bureau of Animal Industry $13,000 less is requested for use in connection with the Bureau experiment station during 1911 than was provided during 1910, making the net increase of the 1911 estimates over the 1910 appropriations $382,100, exclusive of the additional allotments to agricultural experiment stations under the Adams Act. Numerous minor changes have also been made in the estimates, none of them, however, affecting the total amount requested. In the appropriation act for 1910, several of the lump-sum appropriations were broken up into numerous more specific subappropriations, and in the 1911 estimates this plan of subdivision has been considerably extended, notably in connection with the work of the Forest Service. While it is readily seen that this division of lump-fund appropriations into more numerous subappropriations will enable Congress to appreciate more fully how the money for the Department is to be expended, and will, on the whole, make for economy of expenditure, it is equally apparent that the bookkeeping and other clerical work of the Division of Accounts in connection with the large numerical increase in the appropriations will be considerably heavier than heretofore.

DIVISION OF PUBLICATIONS.

During the year 1909 the publication work of the Department exceeded that of any preceding year. A larger number of different publications were issued, and a greater number of copies were printed and distributed. Such an increase was to be expected. Publication is the principal means by which practical effect is given to the studies, investigations, and experiments of the Department. The rapid growth of this Department and the extension of its activities must be accompanied by an ever-increasing volume of printed matter if the Department is to accomplish the purpose of its existence.

The total number of different publications ordered printed during the fiscal year 1909 was 1,200, containing a total of 42,263 printed pages, and the total number of copies was 17,190,345. Of these about 60 per cent represented new publications of the year. These figures do not include an aggregate of more than 10,000,000 copies of weather maps and other minor publications issued from the Weather

Bureau stations outside of Washington. Neither do they account for the printing and distribution by Congress and by the Superintendent of Documents of several million copies of important publications contributed by this Department.

That the publication work of the Department is receiving the attention which it deserves is proven not only by the absence of criticism but by the great and growing demand for the Department's printed matter. In all lines of the work high standards have been set, and the work of the past year shows that the Division of Publications has met the requirements of these standards. The limitations of the printing fund have made necessary the most rigid economy in printing, illustrating, and binding in order to secure the largest possible output of the very best reading matter on all lines of agricultural research and experimentation.

SALE OF PUBLICATIONS.

In order to avoid wasteful distribution of printed matter, it has been necessary to limit more strictly the gratuitous distribution and to depend more largely on the sale of publications by the Superintendent of Documents at prices sufficient to cover the cost of printing. That official reports for the past year a greater sale of this Department's publications than ever before. The total number of copies sold during the year was 117,218, and the amount received for these was $16,293, an average of about 14 cents per copy. The sales of a single publication, that popularly known as "The Horse Book," netted more than $1,100. The sale of agricultural publications has trebled within three years. The most commendable feature of this system is the use of the money resulting from sales in reprinting publications to supply the demand. By this means a large number of valuable publications are made continually available. The Superintendent of Documents during the fiscal year reprinted 55 publications of this Department, issuing a total of 44,354 copies.

FARMERS' BULLETINS.

The first number in the Farmers' Bulletin series was issued in June, 1889, just twenty years ago. The latest issue of the year just closed was No. 361, and the number of copies issued within the twenty years reached the enormous total of 69,454,000. This series embodies the idea of supplying farmers with brief, inexpensive bulletins, written in clear, nontechnical language and filled with practical information. It took several years for the Farmers' Bulletins to gain extensive popularity, but since 1895, when Congress voted annual quotas for distribution by its Members, the growth of the series has been phenomenal.

During the past fiscal year 34 new numbers were added to the Farmers' Bulletin series and two earlier numbers were revised. Of these 1,295,000 copies were printed. Of the earlier issues 235 were reprinted, the number of copies issued being 6,460,000. The total copies of all new issues and reprints amounted to 7,755,000, an aggregate exceeding the total output of any previous year by more than 1,100,000 copies.

I believe it may be safely asserted that practical agriculture in the United States has received more actual benefit through the issue and wide distribution of Farmers' Bulletins than from any other single source.

In view of the limitations necessarily placed on the printing and distribution of the Department's more expensive publications, the importance of maintaining and extending this series is continually increasing. The demand for Farmers' Bulletins is increasing more rapidly than the supply. These facts clearly indicate the necessity for an ample fund to be used in the printing and distribution of these free popular bulletins.

Prior to the year 1908 Congress, in setting apart funds for printing Farmers' Bulletins, provided that undistributed quotas of Senators, Representatives, and Delegates should, after a fixed date, revert to the Secretary of Agriculture, so that the supply of bulletins on hand might be reapportioned in making up quotas for the succeeding Congress or used by the Secretary in supplying miscellaneous demands. This excellent provision periodically relieved the limited storage facilities of the Department, and at the same time enabled the head of the Department to get these valuable publications promptly into the hands of practical farmers instead of allowing them to accumulate in anticipation of congressional orders which might never come. The inclusion of this reversion clause in future appropriation acts is greatly to be desired.

BUREAU OF STATISTICS.

During the year substantial progress has been made in strengthening the organization of the Bureau, perfecting its methods, extending its operations, and conducting special investigations.

GENERAL OUTLINE OF THE BUREAU'S WORK.

The principal lines of work carried on in the Bureau of Statistics may be stated as follows:

1. Gathering and digesting statistical data in regard to crop conditions, with monthly publication of results.

2. Gathering and digesting information in regard to domestic production of crops and farm animals, with annual publication of results.

3. Studies of the import and export trade of the United States in agricultural and forest products, with annual publication of results.

4. Studies of agricultural production in foreign countries and their export and import trade in such products, with compilations published annually.

5. Special studies and investigations of (*a*) agricultural production in the United States over long periods; (*b*) the foreign production of certain crops over long periods; (*c*) foreign markets for the agricultural surplus of the United States; (*d*) problems relating to the transportation of farm products within the United States and across the seas; and (*e*) various important phases of agricultural industry and rural life.

The work under the first two heads—the investigation of crop conditions during the year, and of annual production—is by far the most important, as it is through such work that this Department exercises an important influence on commerce by giving to the world advance information concerning its food supply. Without doubt the statistical data collected and published by this Department give stability to our markets, tend to prevent market manipulators from causing undue fluctuations in prices, and thereby aid the American farmer toward securing just and fair returns for the products of his labor and his invested capital. It should also be added that it is in these two fields of official endeavor that our statisticians secure the original data which form the basis of later and larger studies.

During the year the work of the Bureau was pushed vigorously and successfully along all the lines indicated above.

CROP-REPORTING SERVICE.

In its efforts to secure accurate first-hand information concerning crop conditions, acreage, and yields the Department has perfected an organization which practically covers the entire country four times. There is, first, a corps of township correspondents, at present numbering about 33,000. These report directly to the Bureau for their respective localities. Second, there is a corps of county correspondents who report directly to the Bureau, there being one in practically every one of the 2,800 agricultural counties of the United States. Each of these correspondents usually has two or more assistants located in different parts of the county who report to him. Third, there is a state statistical agent in each State, who has a large corps of local correspondents reporting to him. He not only tabulates these returns, but makes personal observations and reports monthly to the Bureau. Fourth, there is a corps of special agents, each an expert statistician, traveling over a definite area, making personal investigations and securing information from a variety of sources,

and reporting directly to the Bureau. Here, then, we have what might be termed a quadruplication of original research which is practically continuous throughout the year. Besides the special agents and state agents who receive salaries, there are in all about 135,000 voluntary correspondents, mostly farmers, who serve the Department with no compensation other than a limited number of publications and a small supply of seeds. This number includes about 25,000 representative farmers who are called upon at the close of each crop season for a report based on results of their individual farming operations. In addition to the foregoing, there are special lists of cotton, rice, and tobacco correspondents from whom data relating to these crops are secured; and supplementary data regarding wheat and cotton yields are secured, respectively, from millers and cotton ginners.

The Bureau secures its original data mainly by sending out blank forms or "schedules" to be filled and returned by correspondents of the several classes. During the fiscal year 1909, 1,509,000 copies of these blanks were sent out. A greater percentage of these were filled out and returned than in any previous year. Of the county reports, 76 per cent were returned, as compared with 74 per cent in 1908. The percentage of schedules filled and returned by township correspondents in 1906 was only 48 per cent. By 1908 it had increased to 63 per cent, and during the last year it was 66½ per cent. This shows gratifying progress in perfecting the Bureau's organization and increasing interest and appreciation on the part of the farmers.

CROP-REPORTING BOARD.

The reports from each class of voluntary correspondents are tabulated and computed separately, and the data from all the original sources are handled by the crop-reporting board, composed of the Statistician, the Assistant Statistician, one expert statistician in the Bureau, and two special or state agents called to Washingon for this service. The reports derived from the data secured from each original source are taken in hand by the members of this board individually at first and then all act together in arriving at the general average of results. This year, as during several preceding years, this board has done its work under regulations and safeguards which make it impossible for advance information concerning the final figures to be secured by any means, and public confidence in the efficacy of the methods and the honesty of the service appears to be perfectly established.

By the organization and methods just described this Department arrives at an estimate of the crop prospects at the end of each month

with the accuracy and reliability of which it is believed no similar estimate made by private agencies can approach.

SPECIAL INVESTIGATIONS.

A number of important special investigations are in progress in that branch of the Bureau known as the division of production and distribution. Among these may be mentioned the study of transportation problems; investigations of the supply and demand for wheat and meat products; the study of foreign markets in general; studies of the cost of producing various crops; the collection of data in regard to cooperation among farmers in selling and buying, fire and live-stock insurance, telephone service, etc.; and an inquiry concerning the dates of planting and harvesting a large list of crops in different sections of the United States. On some of these lines of investigation important papers have already been published, and on others publications will be issued as the progress of the work justifies.

THE LIBRARY.

The demands on the Library by Department workers and other scientists engaged in agricultural research continue to increase. The charges recorded at the loan desk during the year numbered more than 30,000, and in continuance of the policy of cooperation about 400 books were loaned to scientists connected witb the various agricultural colleges and experiment stations in the different States and in Canada.

Accessions during the year numbered 4,300, among them being many important reference books. Purchases are limited to subjects of special interest in connection with the work of the Department. Valuable publications have been received from all the States and from many foreign governments. Many of these publications probably are not to be found in any other library in this country. The total number of books and pamphlets on hand at the close of the fiscal year was 104,300.

The quarterly bulletins enumerating the accessions to the Library have now attained such a size as to make it seem advisable to publish the list monthly in order to increase its usefulness.

An important work of the Library is the distribution of publications to foreign countries. The foreign mailing lists of the several Bureaus being in its charge, duplication in the sending out of publications is avoided; they are placed where they will be of most service, and useful material is secured in exchange.

The work of indexing and cataloguing, some of which is done in cooperation with the Library of Congress, is on the increase, as well as important work in other lines peculiar to the Library.

OFFICE OF EXPERIMENT STATIONS.

RELATIONS WITH AGRICULTURAL EXPERIMENT STATIONS.

The agricultural experiment stations throughout the United States are increasing the extent and variety of their work, and are reaching the farmers more effectively than ever before. Through substations, demonstration fields, cooperative experiments, special railroad trains, farmers' excursions to the stations, exhibits of improved products, live stock, machinery, etc., at county, state, and national fairs, the practical results of experimental work are being brought home to multitudes of farmers in every State. Cooperation with this Department is being largely increased, and the inspection service of the stations is being broadened.

These things have greatly enlarged and complicated the duties of the Office of Experiment Stations in supervising the expenditures of the federal funds granted to the stations, in summarizing the state publications for dissemination of information of general value throughout the country, and in otherwise promoting the interests of the stations.

Special attention is now being given to the stricter differentiation of the work and publications of the stations as related to the extension departments which are being rapidly organized in the agricultural colleges. It is fortunate that extension work is growing apace, and it will be doubly so if the extension departments are so organized and manned as to relieve the stations of a great burden of routine work which they have been vainly trying to carry. Legislatures, governing boards, and the public generally will do well to draw a clearer line between experimental and demonstration work, and while they liberally support the new extension departments of the colleges, they shonld not forget the needs and requirements of the stations. Public applause, easily, and oftentimes deservedly, accompanies the successful efforts of the demonstrator and lecturer. We are apt to forget the patient investigator who in the laboratory or field is quietly getting the facts and solving the hard problems. We must give him more of our confidence and support, and strive more earnestly to smooth his way to success and make him contented with his task if we are to keep our ablest men in this service and get the greatest results for the improvement of our agriculture. It is impossible for public institutions to compete with private concerns in the financial rewards for scientific service. But the public may so treat and encourage its faithful scientific servants that men of the highest order will gladly devote their lives to the public service. To maintain agricultural research at its highest and best estate in both the national and state service is now one of the most important problems before the American people.

To aid our agricultural scientists in the Department and the colleges and stations in keeping thoroughly informed of the progress of agricultural science throughout the world, special efforts have been made during the year to bring the Experiment Station Record more closely up to date. Twenty volumes of the Record have now been completed. These contain reviews of 71,650 articles, gathered from all quarters of the globe. In this great literature the United States is represented by 3,055 publications of this Department and 7,780 bulletins and reports of the state experiment stations.

By far the greatest part of the work of all institutions for agricultural research consists in the gradual accumulation of data by which light is thrown on agricultural problems and their solution thus gradually brought about. This may be illustrated by brief reference to some of the lines of work in which our stations are now engaged.

Much profitable work is now in progress at the stations on the principles which lie back of the breeding of domestic animals. It will necessarily take years to secure conclusive results.

In the feeding of animals the Missouri Station has conducted a remarkable series of experiments upon the use which steers make of their feed under different methods of feeding, and the Wisconsin Station is showing that, in their effect upon the animals, there are differences between feeding stuffs which are not shown by the composition and digestibility.

Several of the experiment stations are making important discoveries which show bacteria and other microscopic life in the soil to play an important part in soil fertility. Culture is shown to benefit the plant in part by providing favorable conditions for the helpful activity of these organisms.

Success in growing alfalfa in the northeastern States is being gradually attained, and the experiment stations have developed methods by which this valuable forage plant can be grown in New York and the New England States.

Weed seeds in commercial feeding stuffs have been found to be an increasing source of contamination. Some by-products and mixed feeds have been found to contain from 5,000 to 80,000 weed seeds per pound. A large part of these pass into the manure without losing their vitality.

Great progress has been made in the use of miscible oils for spraying for scale and other insect pests on fruit trees. The crude and refined oils are likely to injure the trees; but after much experimenting the stations have devised a means of preparing a miscible oil which is effective and safe.

Studies of ice cream at several of the stations show that there are definite laws as to the relation between the degree of cold, the strength

of the cream, rapidity of freezing, and the volume of the product. These things are being formulated into practical directions for ice-cream manufacture.

AGRICULTURAL COLLEGES AND SCHOOLS.

During the year the agricultural colleges have given instruction in agriculture to more students than in any previous year, and have also done more effective work along other lines. Several of the biennial state appropriations for these institutions have approached or passed the half-million mark, notably in Montana ($487,000), Pennsylvania ($526,000), and Kansas ($671,000). The growth of the agricultural colleges is also indicated by the number and character of college buildings completed during the year. Among the more important of these were the following agricultural buildings: Georgia, $100,000; Iowa, $400,000; Maine, $50,000; Michigan, $175,000; Missouri, $100,000; and Montana, $80,000. Wisconsin has completed a $75,000 live-stock pavilion, and California has started work on a $200,000 agricultural building. The third session of the Graduate School of Agriculture, held at Cornell University, had a larger attendance and was more generally successful than either previous session; graduate schools offering courses in agriculture were established in Illinois and Massachusetts; faculties and courses of study were reorganized on broader lines in Alabama, Arkansas, Georgia, Louisiana, Massachusetts, Oregon, Rhode Island, South Carolina, and Wisconsin; definite provision for training public school teachers of agriculture or for aiding them through extension departments or special publications is now made by agricultural colleges in twenty-seven States, and fully as many of these institutions are engaging actively in other forms of agricultural extension work. New agricultural colleges have been established in Hawaii and Porto Rico, and the former was opened early in 1909.

Secondary courses in agriculture have been started in connection with the agricultural colleges in Montana, Oregon, South Dakota, Texas, and Virgina; two district agricultural high schools have been provided for in Idaho, likewise four in Arkansas with a total appropriation of $160,000, two more in New York with a total appropriation of $100,000, and five in Oklahoma, two of which have been located and have received $20,000 each for buildings and $12,000 each for maintenance. Subsidies have been voted to encourage the teaching of agriculture and domestic science in public high schools as follows: In Texas, $32,000; in Minnesota, $25,000 for ten schools; in Virginia, $20,000 for ten schools; in Mississippi, $1,000 for one school in each county; and in Louisiana $500 to each school approved by the state board of education. In Massachusetts the Smith Agricultural School and Northampton School of Technology has been opened at

Northampton and smaller agricultural high schools at Petersham and Montague.

The introduction of agriculture into the elementary schools has also been promoted actively. In this work the colleges have been particularly active through their summer schools and other teachers' courses and through the preparation of courses of study and school leaflets and the encouragement of boys' and girls' clubs. These clubs are coming to be very effective agencies for interesting young people in agriculture and home making and are now reported from twenty-nine States with a total membership of upward of 150,000. Agricultural college men have also been active in the preparation of text-books and manuals for secondary and elementary schools. One secondary and six elementary texts were published during the year.

In all this work of providing facilities for graduate study in agriculture, reorganizing and strengthening college courses, and multiplying opportunities for acquiring secondary and elementary instruction in this subject, the Department has given its assistance and encouragement through its several branches and particularly through the agricultural education service of the Office of Experiment Stations. The Director of that Office has continued to represent the Department in its relations with agricultural colleges and schools in this country and abroad and has accepted an invitation to act as dean of the fourth session of the Graduate School of Agriculture at Ames, Iowa, in 1910. As chairman of the committee on instruction in agriculture of the Association of American Agricultural Colleges and Experiment Stations he has been engaged in preparing a four-year college course in home economics and a one-year course in animal husbandry and dairying for public high schools.

The Department recognizes the fact that teachers and pupils in the public schools are most effective agencies in the rapid and widespread dissemination of information and that the sending of suitable agricultural literature to the public school teachers who request it is likely to be productive of great good. And while it is true that many of the Department publications are suitable in their present form for use in public schools and many thousands of them annually go into the schools, it is also true that much needs to be done in the way of preparing agricultural literature and compiling information with special reference to the needs and limitations of pupils in the public schools. This function the Department has begun to exercise and proposes to develop more fully in future.

FARMERS' INSTITUTES AND AGRICULTURAL COLLEGE EXTENSION WORK.

Six years ago Congress made an appropriation of $5,000 to this Department to enable it to provide a special officer to investigate and report upon farmers' institutes and similar organizations in this and

foreign countries. At that time the attendance upon the institutes in the United States was reported at 820,000. Now all of the States have institute organizations, and there were held last year 4,926 regular institutes consisting of 15,210 half-day sessions, with a total attendance of 2,196,568, and including railroad specials, round-up institutes and other forms of institute activity of almost three millions (2,906,699). This represents an increase in attendance at the regular institutes over the year 1903, when the Department first secured an appropriation for conducting investigations along institute lines, of more than 167 per cent, and if all forms of institute activity are included of about 270 per cent. The appropriations by the States for the support of these institutes for the last year amounted to $338,000.

Extension courses in agriculture have now a recognized plaee in the system of instruction provided by the land-grant colleges. This Department can materially aid this movement by adding to its present force of investigators a number of expert specialists who shall devote their time to perfecting forms of organization and devising methods of demonstration along extension lines and to conducting extended investigations and researches relating to the extension of agricultural instruction. The extensiou feature in the teaching of agriculture has suddenly come into such prominence as to make it incumbent upon this Department to recognize it and give it assistance at least equal to that which it now gives to the colleges in their resident instruction and to the experiment stations in conducting researches and investigations.

Normal institutes for the instruction of farmers' institute teachers have now become a part of every well-organized institute system. Eight of these normal schools were reported during the year, with an attendance of 1,000 institute lecturers.

Fourteen States ran railroad specials and report an attendance of over 159,000. Numerous other railroad specials were conducted by state boards of agriculture and by the agricultural colleges, independent of the institute organizations. More than any other agency these specials have interested the managers of the transportation companies in the improvement of agriculture. The railroad companies now not only furnish trains to the institute directors free of charge, but they provide also board and lodging for the instruction force.

Movable schools of agriculture are fast becoming leading features in farmers' institute development, over 2,500 persons being registered as students in these schools during the year. The instruction is given by skilled teachers to classes of adults regularly organized, and the sessions continue from one to three weeks in a locality. Wherever they have been tried they have been found very satisfactory. The Department has had prepared model courses of study for use in such schools,

and has in preparation additional courses, some of which it hopes to equip and put into operation as illustrations of the best methods of conducting them and as demonstrations of their practicability and value.

Special subject institutes are being introduced in many of the States. Where these are conducted the entire institute period is devoted to the treatment of a single subject, discussing it thoroughly in all of its features. This form of institute has been found to be much more valuable than an equal amount of time given to the superficial discussion of several topics. Over 17,000 persons were in attendance upon meetings of this character during the year.

Institutes especially intended for women are rapidly being organized. Twenty-one States held institutes of this character in 1908. The need for more definite instruction for country women in domestic and sanitary science and household art than is given in the ordinary institutes for men has brought about a great demand for institutes for women. To a great extent the mental, moral, and physical welfare of the family depend upon the home keeper, yet hitherto her opportunities in the country districts for qualifying herself for fulfilling her duties have been chiefly such as she could create for herself. The women's institute is a step in the direction of supplying this need by furnishing information to women at their homes of a kind most helpful and best adapted to their wants. A circular has recently been issued upon this subject by this Department, calling attention to the importance of the work and outlining methods by which women's institutes may be organized and successfully conducted.

THE DEPARTMENT'S INSULAR AGRICULTURAL EXPERIMENT STATIONS.

In Alaska during the past season special efforts have been made to develop the station near Fairbanks, in the Tanana Valley. In order to equip and develop this it was found necessary to close the Copper Center Station temporarily, and the buildings and lands have been turned over to the Bureau of Education of the Department of the Interior for use until such time as this Department desires to resume work at that place. The investigations with cereals are being extended, and while, in 1908, 57 out of 65 varieties of grains fully matured at the Rampart Station, located 65° 30′ north latitude, the results this year were still more favorable, practically every variety of spring grain ripening its crop. Winter rye and winter wheat survived the rigors of the winter and were fully matured where the snow was not blown from the plats. Oats sown for hay produced a heavy crop of grain, and it can be confidently asserted that barley and oats can be successfully grown in the Yukon and Tanana valleys, so as not only to supply the needs of the grower, but also to yield a surplus

for market. The selection and breeding work with cereals is being continued, and some forms have been bred that appear to be superior to the original varieties from which they were obtained. It is believed that within a few years varieties will be developed that are fully adapted to Alaskan conditions. The experiments at Fairbanks have not been in progress long enough to warrant definite statements regarding them, but the results thus far obtained have been quite favorable, and it is intended at this station to prove or disprove the possibility of profitable farming in that portion of Alaska. The Galloway cattle at the stock-breeding station on Kodiak Island wintered satisfactorily without any shelter other than that afforded by an open shed. During the summer they grazed on native grasses and throughout the winter were fed exclusively on hay and silage made from native grasses. A larger range for the stock has been fenced during the season just past. The horticultural investigations conducted at the different stations have fully demonstrated the possibility of producing an abundance of hardy vegetables of good quality. The special agent in charge reports the fruiting of more than a thousand of the strawberry plants produced by crossing the wild and cultivated varieties, and the fruit of some of the plants compared favorably in size and quality with the best of the cultivated varieties. It is believed that the hardiness of the native variety and the quality of the cultivated ones have been successfully blended in the new varieties.

The efforts of the Hawaii Station to diversify the agriculture of those islands are beginning to show results. The discovery of some of the difficulties attending the shipment of fresh fruit and means for their control has been followed by greatly increased shipments, particularly of pineapples. Methods for the propagation of citrus, mango, and avocado trees have been worked out, and with the investigations now in progress in orchard management it is believed that most of the obstacles that have prevented the increased production of tropical fruits will be removed. The rice investigations, which have been in progress for several years, have developed better and more prolific varieties and have made possible the devising of methods for the fertilization of the crop which more than double the yield of ordinary rice lands. Great interest is being taken in the experiments with cotton, especially with the Sea Island varieties, of which the station has several well-marked strains. Heavy yields of all the varieties have been obtained, and of some of the Sea Island strains the yield exceeds anything hitherto reported, while the quality of the fiber is most excellent, the fiber being in some cases very silky and more than 2 inches in length. It has been found possible to grow cotton either as an annual or as a perennial, and when it is grown as a perennial by pruning and cultivation the time of maturity of the bolls can be controlled. As a result of the station's experiments

about 100 acres were planted to cotton this year and probably 1,000 acres will be planted in 1910, some of the areas formerly in cane being given up to this new crop. The station has devoted considerable time to a study of the causes of the yellowing of pineapple plants in the field, and it has been found chiefly due to the presence of large amounts of manganese in the soils. Experiments are now in progress to overcome the undesirable soil conditions. The rubber investigations have been highly satisfactory, and as a result of experimental tappings of 500 trees the most economical methods of tapping and coagulating the latex have been worked out. The experiments have shown the possibility of the profitable production of rubber from Ceara trees in Hawaii. There are now 1,500 acres or more of rubber trees planted in Hawaii, and the profitableness of the new industry seems to be assured.

On account of the primitive condition of agriculture in Porto Rico, much of the work of the station is devoted to demonstrations. Investigations are being carried on by the different departments of the station, however, and results of immediate benefit have been obtained. Especial attention is now being given to the production of citrus fruits. Wind-breaks for orchards are being extensively planted as a result of the station's demonstrations. The work with pineapples has practically revolutionized the former practices and has made possible the considerable expansion of that industry. Important studies on Porto Rican soils have been begun, looking toward the renovation of the soils that have become worn through continued cropping. A study has been made of the reason of the lack of fertility in certain soils and a cause determined, together with methods for its control. One of the chief causes for the so-called "tired" or "sick" soils was found to be of bacterial origin, which can be corrected by cultural and other methods. An important contribution of the station to the agriculture of the island has been the introduction of improved cane seedlings, and these are being planted as rapidly as the station can supply the demand. The highly valued coffees of Arabia, Java, and other countries have been introduced, and from the few fruits that have been borne it is evident that the peculiar flavors which characterize them have been retained. These are being propagated and distributed as rapidly as possible, in order to supply a kind of coffee better suited to American tastes. Considerable advance is being made in the improvement of the live stock of the island. The station has introduced several breeds of cattle, swine, and poultry, and is disposing of the surplus, but the supply is not at all equal to the demand. It has also introduced woolless sheep for mutton purposes, milch goats, Brahman cattle, and saddle-bred horses, all of which are being used in breeding experiments. An experiment has been successfully carried on in ensiling Para grass

and cane tops, when they are plentiful, for feeding during the dry season. The station has introduced some Italian bees and established an apiary, the increase from which is in great demand. While the honey produced is a direct source of income, the presence of large numbers of bees will, it is thought, assist in better pollinating the coffee during the short period of its flowering, and thus contribute to the general prosperity of the island. The material equipment of the station has been greatly increased, and a new office and laboratory building provided by insular funds has been completed and equipped.

After a considerable delay negotiations were completed for a site on the island of Guam, and preliminary work was begun for the establishment of an agricultural experiment station. The work at this station for some time will of necessity be confined to the introduction of improved varieties of crops and animals and demonstration experiments. Agriculture in Guam is extremely primitive, and only by repeated object lessons will much advance be obtained. A considerable number of varieties of grains, fruits, forage plants, etc., have been introduced, and their adaptability is being determined. A period of unusual drought was experienced in Guam early in 1909, and as a result planting was considerably delayed. Kafir corn of several varieties has been introduced and the growth the first season was all that could be desired. Not only was a large amount of forage produced, but it yielded heavily in grain. Experiments are being conducted with a large number of varieties of maize, tropical fruits, and forage plants, many of which were sent from the Hawaii Agricultural Experiment Station. The tropical fruits are reported as growing vigorously, and the varieties are believed to be superior to those already growing in Guam. They should prove to be valuable additions to the economic plants of the island. Other economic plants have been introduced from Java and elsewhere, and as rapidly as supplies are on hand they will be distributed to the people for cultivation. In order to increase the amount of forage and to restore the former fertility of the soil a considerable number of varieties of leguminous plants have been introduced to grow in rotation or between the rows of other crops. An experiment is in progress to determine the possibility of reclaiming some of the savanna lands that are now of little value. These soils are low in nitrogen and organic matter and are very retentive of moisture. A small area has been planted to a leguminous shrub in the hope that this will grow in the savanna soils, and after becoming established will serve as a shade for more valuable species. Cooperative experiments have been begun in a limited way with a few farmers, and seeds of field and garden crops have been gladly accepted for trial planting by quite a number of ranchers.

NUTRITION INVESTIGATIONS.

A problem of special importance which is being studied in the course of the nutrition investigations of the Office of Experiment Stations is the ease of digestion of cheese made in different ways and cured for varying lengths of time, such data being needed to round out the extended series of investigations which have demonstrated the thorough digestion of cheese and its great value as an article of diet when used in quantity. Information will also be sought by means of experiments with the respiration calorimeter (which has now been reconstructed in Washington) regarding the comparative value for the body of olive oil, lard, butter, beef suet, and other table and culinary fats. Studies are also contemplated which will supply additional and much needed data regarding the value as food of fruits and nuts and products made from them. In all this work the respiration calorimeter is essential for measuring factors which can not be determined by any other means.

For several years studies were carried on of the food value of meat of different kinds and cuts prepared for the table in various ways, and much valuable information was provided as a result of this work. From the data at hand and the results of some special tests, a summary has been prepared regarding the use in the home of the cheaper cuts of meat, a question which is now of decided importance in economical household management.

The nutrition investigations of the Department have an intimate relation to the work of the experiment stations and the agricultural colleges. In response to a widespread demand from farmers and others, some of the experiment stations are studying problems which pertain to human food, while the agricultural colleges are conducting courses in home economics in which instruction concerning the nutritive value of different foods and ways of handling and cooking them are important features.

A recent act of Congress has stimulated the agricultural colleges to organize courses for teachers along this line as well as other branches of agriculture and mechanic arts. The work is also being taken up by primary and secondary schools all over the country, and is growing so rapidly that the demand for teachers and information exceeds the supply.

Students, teachers, investigators, managers of institutions where large numbers of persons must be economically fed, and housekeepers and other individuals interested in home problems are turning to the Department in increasing numbers for publications and other information and for suggestions.

IRRIGATION INVESTIGATIONS.

During the year the activity in the construction of irrigation works has not lessened, but, if anything, has increased. New works are

built at a constantly increasing cost, requiring more capital in the hands of settlers and the growing of more valuable crops, thus limiting the number of people from whom settlers may be drawn, and restricting also the range of crops which can be grown at a profit, making the securing of settlers more difficult and decreasing their chances for success. For these reasons there is great danger of overbuilding and a recurrence of the experience of twenty years ago, when canals were built so far in advance of settlement that the lands under them are not all reclaimed yet. With the present cost of water rights and the large expense of preparing arid lands for the growing of crops under irrigation, settlers can not afford to spend either time or money in working out for themselves the best methods of preparing their land for irrigation, of building their ditches and other structures, and of applying water to their crops. For this reason the irrigation investigations carried on by this Department have for the past few years been devoted very largely to collecting information as to the best methods of performing all the agricultural operations connected with irrigation, and supplying this information to settlers, principally in the form of practical bulletins, but also by demonstrations on farms maintained in cooperation with several of the state experiment stations and by personal advice and public lectures.

The activity in construction of irrigation works and the widespread promotion of these enterprises have created a great demand for reliable information as to the agricultural resources of the arid region, the laws and institutions controlling the use of water in irrigation, and the cost of water, methods of using it, crops grown, etc. This has been met to a considerable extent during the past year by the publication of a series of reports on irrigation in the several States and Territories of the arid region, the effort being to bring together in these bulletins, from reliable sources, the information needed by persons considering settling in that section. Eight of these bulletins have been published during the year.

There are, however, sections where the demand is not for more settlers but for more water. The available water supply has been utilized, and agricultural extension depends upon a more economical use of this supply. Eventually this will be the prevailing condition throughout the arid region, since under the most economical use only a small part of the arable land can be irrigated. On the basis of studies made by the Department it has been estimated that the water at present turned into the main canals in the arid region can be made to serve approximately double the area now irrigated with it, since not much more than half the water entering the canals reaches the land, and there are large losses in application. The prevention of these losses in transmission and in application to fields is the most promising source of an increased water supply. Much attention has, therefore, been devoted to determining how much water is re-

quired to grow crops under different conditions, how much is lost, the source of loss, and the means of preventing losses. This involves experiments to determine the moisture conditions under which crops make their best growth, and to work out methods of securing and maintaining these conditions, with the use of a minimum quantity of water, including the adaptation of methods of applying water to different types of soils, the quantities of water which should be used in each application, and the methods of cultivation which most effectually protect the soil moisture from evaporation; measurements of water flowing in canals to determine the magnitude of losses in transmission, and the points at which losses occur; and the experiments with different methods of lining canals to stop seepage losses. Our investigations show also that the laws and regulations under which water is distributed to irrigators and the systems of charging for the water used have a great influence upon the efforts made to economize in its use, and these systems are being studied from that standpoint. By demonstrating the extent of losses and the possibility of eliminating them, and by working out systems of management which will give the incentive necessary to induce water users to use no more water than is necessary, the Department may be the means of doubling the area irrigated at an expense that is merely nominal as compared with the expense of developing additional water supplies and building the works to make them available.

Settlement on the semiarid plains has continued during the past year, with little diminution, but each added year of experience demonstrates more fully the value of the plan advocated by this Department of irrigating small areas in connection with the farming of larger areas without irrigation as an insurance against total crop failure and to provide a home-grown food supply. The farms established several years ago for the purpose of determining and demonstrating the value of this practice and the methods to be employed have been maintained during the year. In addition, information as to the use of windmills for pumping water for irrigation on the plains has been collected and prepared for publication, and accurate tests of mills of different types have been made, in order to supply information as to their most economical use and to work out improvements in their construction. These tests promise to bring about improvements by which a much larger part of the power of the wind may be utilized, making it a most valuable source of power.

The recent years of drought in the East and the spread of intensive farming in that section have caused eastern farmers to realize that they can not afford to depend entirely upon rainfall for the maturing of their crops, and they are calling upon this Department for information as to methods of securing and utilizing water supplies for irrigation. In response to this demand, an expert has been detailed

to the eastern field and is devoting his time to a study of eastern conditions and the adaptation of western irrigation methods to these conditions.

DRAINAGE INVESTIGATIONS.

DRAINAGE IN THE IRRIGATED REGION.

Among the most important investigations in drainage are those which are conducted upon irrigated lands. For years it has been known that some irrigated fields easily become swamps, while the productiveness of others is ruined by the accumulation of injurious alkali. The lands which are most easily irrigated by water from the mountain streams, and which are surprisingly productive when first reclaimed from a desert condition, not infrequently become noisome bogs or alkaline wastes after a few years of cultivation under copious irrigation. This is true of a portion of every irrigated valley in the West. Utah contains not less than 150,000 acres of such land; Colorado, 75,000; California, 100,000; Nevada, 250,000; Wyoming, 50,000; Montana, 60,000; Idaho, 40,000, all having been once cultivated and still having valuable water rights. These are conservative estimates, showing the gravity of the situation, and when considered from the point of the owners particularly emphasize the importance of using preventive as well as curative measures in the treatment of saturated lands which are under irrigation.

OVERIRRIGATION NOT ALONE RESPONSIBLE.

While an injudicious use of water and a faulty distribution system hasten the formation of seeped land, it is acknowledged by good irrigators that in ordinary farming practice there is a waste of water which can not well be avoided. Where there is not good drainage, the surplus water accumulates until evil results appear.

Experiments and examinations have brought out some useful as well as encouraging facts about seeped lands and the methods of restoring them to productiveness. The changing of a productive soil into a bog or alkali waste is a process hidden from view, and, like an insidious disease, is often not discovered until disastrous results are manifest. The lower lands begin to fill with water at varying depths from the surface, the level rising gradually until it reaches the surface. The movement of the soil water is modified by hardpan gravel and shale formations, as well as by other less pronounced physical characteristics. The effects manifest themselves by the utter failure of crops in spots, which enlarge yearly until the entire field becomes barren and often so soft that it can not be crossed by teams. The injury extends from farm to farm until the larger part of an irrigated valley becomes covered with salt grass, alkali weeds, or, in many instances, becomes a barren alkali waste.

PRINCIPLES WHICH APPLY IN DRAINING IRRIGATED LANDS.

The restoration of such land, as determined by investigations and experiments conducted by this Department, may be accomplished by suitable drains located in accordance with a few simple laws which are found to govern the behavior of water, particularly the underflow in irrigated soils. These laws are briefly as follows:

The source of the surplus water is the leakage from canals, but more especially the waste water from irrigated lands which occupy the higher levels.

Soil water is frequently deflected in its course, as it percolates through the soil, by layers of hardpan. Water which finally reaches the lower lands is arrested in its downward percolation by comparatively impervious earth, and then rises year by year until the surface is saturated.

Water dissolves a considerable quantity of the salts which are present in the soil. When evaporation takes place at the surface the salts, many of them being injurious to plants, accumulate rapidly.

METHODS OF DRAINAGE.

While such lands in the several irrigated districts show great differences in condition and in the facility with which they may be reclaimed, as well as in relative value after restoration to a productive condition, the following methods have in most instances proved effective.

One drain should be placed along the upper edge of the wet land approximately across the surface slope and sufficiently deep to intercept the underflow from the higher land. Frequently this depth must be from 5 to 7 feet. The drain may be a large open ditch, a covered lumber-box drain, or a large pipe, according as may be expedient in such locality. Where the land lies in a series of benches, drains should parallel the upper border of each bench.

A few drains are usually required in the lower parts of the fields to remove surplus water which is supplied directly by irrigation or rainfall. These should be located in the depression, but should not be constructed until the intercepting drains have cut off the supply from outside sources.

Drainage wells have proven effective where gravel formations are found bordering the saturated lands. When placed at well-selected intervals and sunk to a depth of 8 to 10 feet they collect free water which, rising in the wells, is removed by tap drains placed at convenient depths and discharging into some adequate outlet.

These measures, simple in principle and easily described, are sometimes difficult to carry out. A thorough examination of the under strata of the soil, by means of auger and testing rod, is a necessary

preliminary to the location of any and all drains. Deep drains only are efficient. While subsequent treatment by means of washing and special crops is required to restore lands which have become highly charged with alkali, drainage alone, with some special irrigation and judicious cultivation, will quite frequently restore the land to its original productiveness in one or two years. Where alkaline conditions do not prevail the restoration is marked and immediate.

COST OF DRAINING IRRIGATED LANDS.

By means of the investigations of the Department carried on in cooperation with landowners in several States, the practicability of draining lands of this class at a reasonable cost has been shown and is now admitted where experimental work has been done. It is estimated that there are not less than 725,000 acres of irrigated land which has become seeped and is susceptible of drainage. The cost of draining the land will be $15 to $25 per acre. It is located in the older irrigated centers and is furnished with paid-up water rights, and will easily be worth $100 an acre when reclaimed. Basing estimates on this price and on a cost of draining of $20, the net gain in value brought about by drainage would amount to $58,000,000. In view of these conditions and facts, farmers who own lands of this class can better afford to reclaim than to abandon them, or, as is frequently done with the lands less seriously injured with water, to use them for salt-grass pastures.

DRAINAGE IN HUMID REGIONS.

The Department is actively promoting the drainage of wet lands throughout the humid regions of the United States. Examinations of such lands, followed in many cases by the preparation of definite plans for their drainage, have been made in twenty States during the year. Large areas are now being reclaimed in accordance with the Department's plans. Special studies have also been made of the methods for reclaiming turf and peat lands in the Northern States and for draining the salt marshes of the Atlantic coast.

OFFICE OF PUBLIC ROADS.

The Office of Public Roads has continued the work of aiding road improvement by studies, experiments, and object lessons. Proper construction and maintenance of public highways engages public and official attention to a great extent, and the Office of Public Roads has proven its usefulness to the general public more emphatically than ever before. The adoption of state aid in the construction of public roads by more than half the States and the consideration of the question by the remainder, together with large bond issues by

many counties, are indexes of the general interest being shown in the work, and have occasioned a great demand upon the Office for advice and assistance. These have been given to the fullest extent compatible with the resources of the Office, and have brought about more active cooperation and larger material results than ever before.

OBJECT-LESSON ROADS.

During the past year especial attention has been given to object-lesson work. Of the total appropriation of $87,390 made for the Office, $16,916.79 was expended in carrying out demonstrations on 69 sections of road, with a total surface area of 661,992 square yards, as against $17,908.25, expended on 31 sections, with a total of 223,208 square yards, during the preceding year. These operations covered 12 macadam, 26 sand-clay, 7 gravel, 10 earth, 1 shell, and 15 experimental roads. The experimental roads consisted of 8 sand-clay, 1 burnt clay, and 6 roads in which oil or asphaltic products entered as binder. The purpose of these object-lesson roads was to give elementary instruction to local road builders and to demonstrate the possibilities of road improvement. They were built under cooperative arrangements by which the local authorities paid all expenses of machinery, labor, tools, and materials, the Government providing for the engineering work. So effective has been this phase of the educational work of the Office that the number of square yards constructed has grown from 79,203 in 1905 to 661,992 in 1909.

The policy of the Department in this work leads neither to extremes of conservatism nor radicalism, but toward pointing out the most profitable use of material and means at hand in a given locality. In pursuing this policy communities with abundant resources have been encouraged to use them more freely, and thinly settled regions have been protected against results of enthusiasm for expensive roads, and materials have been proven available which, until recently, had been regarded as of little value.

EXPERIMENTAL WORK.

Second in importance only to object-lesson work is the experimental work of the Office. The most important problem considered has been that of preventing the destructive action of automobile traffic on costly macadam roads. In working out this problem experiments have been made to secure satisfactory binders and dust preventives within reasonable cost. Excellent results have been attained in the use of asphalt, tar, and other bituminous binders, waste from sugar refineries and wood-pulp mills, and other by-products. It was largely to consider this question that the greatest road convention ever held was convened at Paris, France, in which

29 countries participated, the Director of the Office of Public Roads being chairman of the commission of three representing the United States.

Especial attention has been given to experiments with blast-furnace slag—alone and in combination with other materials—in the construction of roads, to find a way to utilize the large quantities of this waste material available.

The sand-clay road has been found so satisfactory in the South that it has been introduced into several of the Western States, notably Iowa, Kansas, and Nebraska. The construction of such roads is expected to prove of great value in the trans-Mississippi States.

During the year 185 lectures were given by representatives of the Office of Public Roads in 29 States, as against 200 lectures the preceding year. This decrease was not due to any lack of demand for this character of assistance, but rather to the necessity of withdrawing engineers from the lecture platform to supervise object-lesson work. These lectures were not given for entertainment, but to educate those who have to do with the construction of roads and the administration of highway affairs.

In the experimental work of the Office, that on the corrosion of iron and steel has been continued with favorable results. This work was inaugurated to find means of lessening depreciation in iron and steel culverts in road work, and was later extended to fence wire. Upon the findings of this Office a number of manufacturers have installed improved methods of manufacture which promise to remove many of the difficulties heretofore encountered.

The advisory work of the Office, aside from object-lessons and lectures, comprises the introduction of model systems and special advice and inspection. The work with model systems involves assignments under which an engineer of the Office examines the entire road system of a county, its road materials, and other phases of the public-road situation, and makes a detailed report, with advice as to best methods and materials. Five counties have been so assisted during the past year. Assignments for short periods have been made for aiding in the solution of local problems in 142 cases.

An attractive and instructive exhibit was made at the Alaska-Yukon-Pacific Exposition at Seattle by the Office, the details of which were described in a small handbook.

COOPERATION WITH OTHER BUREAUS, ETC.

The Office of Public Roads cooperated with the Forest Service in the location of trails; with the U. S. Geological Survey and the geological surveys of several States in the investigation of road materials; with the American Society for Testing Materials in standardizing tests for road materials; with the Post-Office Department in

the inspection and improvement of rural delivery roads; with state experiment stations in devising ways and means for joint work; with the Isthmian Canal Commission in tests of materials; and with state highway officials and various scientific societies.

ENGINEER STUDENTS.

The demand for skilled road engineers shows no abatement. The success attending the instructions given in the Office of Public Roads has led to an investigation of the status of highway engineering in various technical schools and colleges. It was found that greater attention is given to this branch of engineering than heretofore. The policy of appointing engineer students in the Office of Public Roads has been continued with good results. Under this policy a limited number of young men with engineering training are appointed at small salaries and, after a course of thorough instruction in highway work, are advanced to the position of assistant engineer and given practical work in the field. The success of the plan is demonstrated in the increased drafts on this corps for state and municipal work.

Summing up the results of the year, it may be safely said that the work of the Office of Public Roads during the past year has been more successful than ever before. It is not intended to make any material changes in the general plan of the work during the current year.

SALARIES OF SCIENTISTS.

There is a provision of law pertaining exclusively to this Department which limits to $3,500 the annual compensation which may be paid from the lump fund appropriations to any scientific investigator in the city of Washington, or other employee engaged in scientific work. Many of the lines of work carried on by the Department of Agriculture require the direction of men of high scientific attainment, and as these men, particularly after years of additional training and experience in Department work, can command much higher salaries outside of the government service, it is with difficulty that the Department of Agriculture is able to retain them. I have therefore recommended to Congress, in the estimates for the fiscal year ending June 30, 1911, that this maximum salary be increased from $3,500 to $4,000, not, however, with the view of a general advancement of this class of employees, but rather for the purpose of recognizing the services of those few who signally distinguish themselves in the Department by extraordinary scientific discovery or invention inuring to the especial benefit of the agricultural and kindred interests of the United States. The Department has already lost many of the ablest members of its corps of scientists, who have been tempted by more attractive offers from the outside, and these losses will un-

doubtedly continue to occur unless Congress, by increasing to $4,000 the present legal limitation, permits the Secretary of Agriculture this latitude in fixing the compensation of the various members of his scientific staff.

FIELD DIARIES.

In connection with the gathering of agricultural statistics, farm demonstration work, soil survey work, meat inspection, enforcement of the Food and Drugs Act, administration of the National Forests, and numerous other lines of scientific investigation prosecuted by the Department of Agriculture and involving field service, a great many agents are employed who travel more or less constantly at government expense. The itemized expense accounts of such officers are carefully audited before being paid by the Department, but with a view to having an even closer supervision of expenditures of this character and the necessity therefor, each traveling employee is now required to keep a field diary and enter therein a comprehensive summary of his official acts from day to day. This diary is subject to the inspection of both the administrative officer of the Bureau concerned and the disbursing officer of the Department; the former is thereby enabled to determine whether items of expense incurred were in all cases necessary in connection with the performance of the duties required of the traveling employee, while the latter finds the record of direct value in the audit and administrative examination of the expense account when submitted for payment.

CONSOLIDATION OF WORK.

In the act making appropriations for the Department of Agriculture for the fiscal year 1909, Congress appropriated $25,000 for the construction of a building to be used for stables, storage purposes, and the consolidation in one shop of the various lines of mechanical work conducted by the different branches of the Department. This building, known as the mechanical shop building, has been completed, and all repair work is now centralized under one roof with considerable saving of labor and expense. With a view to further simplifying the work and making for economy, I have, in the estimates for 1911, transferred to the contingent fund, from the appropriations for the several Bureaus, Divisions, and Offices, certain sums of money proportional to the repair work on buildings and office fixtures done for them, and such amounts as they may severally require for incidental expenses in the city of Washington, such as fuel, electric light, gas, ice, etc., and it is recommended that the Congress enact this suggestion into legislation and that the contingent fund of the Department be increased accordingly. Also

during the fiscal year 1909 all watchmen and charwomen were transferred to the roll of the Office of the Secretary, thus centralizing, under the supervision of the Chief Clerk of the Department, all employees engaged in the preservation of buildings and grounds. In view of the large area of the reservation occupied by the Department, the many buildings thereon, and the many buildings rented in the immediate vicinity, such a concentration of the mechanics, watchmen, and charwomen had become imperative and would have been accomplished at an earlier date had the shop building been available.

I have endeavored in the foregoing report to call attention to the work of the Department during the past year in all its Bureaus, Offices, and Divisions. The new responsibilities laid upon us have been met with fidelity and with what ability we possess. We are helping the farmers of all sections of the country and the isles of the sea, and results are becoming evident. The soil is responding to better methods and more suitable plants, the farm income is increasing, farm education is making the rural home more attractive, each locality is becoming more useful to the others, each specialty more necessary to the others. Abundance contributes to happiness—people of the several States are learning to know each other better and love each other more.

Respectfully submitted.

James Wilson,
Secretary.

Washington, D. C.,
November 20, 1909.

THE FARMERS' COOPERATIVE DEMONSTRATION WORK.

By S. A. Knapp,
Special Agent in Charge of Farmers' Cooperative Demonstration Work, Bureau of Plant Industry.

PURPOSE OF THE WORK.

The aim of the Farmers' Cooperative Demonstration Work is to place a practical object lesson before the farm masses, illustrating the best and most profitable methods of producing the standard farm crops, and to secure such active participation in the demonstrations as to prove that the farmers can make a much larger average annual crop and secure a greater return for their toil.

This work shows also that there is no necessity for the general deterioration of farms and the too common poverty of the rural masses.

Briefly stated, the salient features of the rural lessons given by the farm demonstration work are as follows:

(1) Better drainage of the soil.

(2) A deeper and more thoroughly pulverized seed bed; deep fall breaking (plowing) with implements that will not bring the subsoil to the surface.

(3) The use of seed of the best variety, intelligently selected and carefully stored.

(4) In cultivated crops, giving the rows and the plants in the rows a space suited to the plant, the soil, and the climate.

(5) Intensive tillage during the growing period of the crops.

(6) The importance of a high content of humus in the soil; the use of legumes, barnyard manure, farm refuse, and commercial fertilizers.

(7) The value of crop rotation and a winter cover crop on southern farms.

(8) The accomplishing of more work in a day by each laborer by using more horsepower and better implements.

(9) The importance of increasing the farm stock to the extent of utilizing all the waste products and idle lands of the farm.

(10) The production of all food required for the men and animals on the farm.

(11) The keeping of an account with each farm product, in order to know from which the gain or loss arises.

PLAN OF ORGANIZATION.

The Farmers' Cooperative Demonstration Work is conducted by a special agent in charge, who reports directly to the Chief of the Bureau of Plant Industry. There are five general assistants and a full office force; also a corps of field agents is employed, classified according to territory in charge, as state, district, and county agents. These agents are selected with special reference to a thorough knowledge of improved agriculture and practical experience in farming in the sections to which appointed. The county agents are appointed mainly on the advice of local committees of prominent business men and farmers conversant with the territory to be worked. Each agent has in charge the practical work in one or more counties, strictly under such general directions as may be issued from the central office at Washington, D. C. District agents are expected to have not only a knowledge of scientific agriculture, but to be practical farmers and to have had considerable experience in the demonstration work. State agents are strong and capable men, who have shown their ability to carry out successfully the instructions of the central office over a large territory, and they are especially qualified for the work by the possession of the tact necessary to influence men.

The term "demonstration farm" is used to designate a portion of land on a farm that is worked strictly according to our instructions. This is visited by an agent as often as once a month, if possible, to see that these instructions are carried out and to give any further advice necessary.

A "cooperator" is a farmer who agrees to work a part or all of his crop according to our instructions.

The Farmers' Cooperative Demonstration Work now covers portions of 12 States, employs 375 traveling agents, has many thousand demonstration farms, and potentially influences, through boys' corn clubs, field schools, and cooperators, a much larger number than are classed as demonstrators. At present it has close cooperation with six agricultural colleges and a large number of rural schools, assisting the latter to make field demonstrations. It also cooperates with state and county superintendents of public instruction in demonstrations for boys' corn clubs.

This work is supported by Congressional appropriation, by liberal contributions from the General Education Board, by county aid, and by donations from boards of trade and private individuals.

A REAL RURAL SCHOOL FOR THE MAN WITH THE PLOW.

The demonstration work may be regarded as a system of adult education given to the farmer upon his farm by means of object lessons in the soil, prepared under his observation and generally by his own hand.

The teaching by object lessons is more effective where it is simple, direct, and limited to a few common field crops, such as cotton, corn, cowpeas, and oats in the South, so that the comparisons may be evident and accepted at a glance. If general success can be secured with these standard crops, further diversification follows as a natural result.

The instruction given for the first year mainly refers to the method of making a larger and more profitable crop at a reduced cost of production, and consists of four lessons, called "the primary lessons:" (1) The best seed bed and how to make it; (2) the best seed of its variety and how to obtain it; (3) frequent and mainly shallow cultivation of the crop—how and why; (4) the use of better teams and tools to secure more economic production.

The principal defects in the seed bed for farm crops in the South are shallow breaking (plowing), failure to fully pulverize the soil before planting, insufficient humus in the soil, and defective drainage. Such a seed bed can never produce maximum crops. It carries insufficient moisture for periods of drought and has an excess under heavy precipitation. During most of the period of growth the plants are insufficiently nourished, either from inability to obtain sufficient food through lack of moisture or a too diluted nourishment through excess of moisture. The result is a small crop.

The simple remedy is deeper breaking in the fall, thorough use of disk and harrow, plowing under of green crops at frequent periods, and an improvement of the drainage by ditches or tiles.

One cause of the general shallow breaking in the Southern States is the single mule used on many farms (see Pl. I, fig. 1) and the light mules where they are used double. The introduction of the disk plow, as shown in Plate I, figure 2, enables one man to do nine times the work in a day of the one man shown in Plate I, figure 1, and do it easier. The one man with one mule is expected to break an acre a day 3 inches deep; one man with a disk plow and four large mules will average 3 acres a day 9 inches deep on rather stiff soil and do a better job.

SEED.

Prior to the commencement of the demonstration work the average farmer in the South gave little attention to seed selection. Corn was culled in the spring from the crib and cotton from the gin-run pile and planted without testing. The result was a poor stand—a condition that can rarely be remedied.

The demonstration work requires seed of a known type, carefully selected, graded, and stored for the first year's planting, and for each succeeding year the planting of a small field remote from any grain crop of the same type; this seed patch to be specially prepared, fertilized, and planted with the seed selected in the field the previous fall when the grain was ripe and afterwards stored in a dry place.

CULTIVATION.

Great use is made of the section harrow before and after planting and when the plants are quite small. Cultivation of cotton or corn in rows is at first deep, but shallow and frequent after the plants are 10 inches tall. This conserves the moisture.

*In the practical application of these instructions it has been found that the best seed bed added 100 per cent to the average crop on similar lands with an average preparation; planting the best seed made a gain of 50 per cent, and shallow, frequent cultivation was equal to another 50 per cent, making a total gain of 200 per cent, or a crop three times the average. With better teams and implements this greater crop is made at less cost an acre. The profit increases faster than the yield. If the net profits on a crop of corn yielding 20 bushels an acre, valued at 75 cents a bushel, be $3, on a crop of 60 bushels the net profit would be $33 an acre; that is, the profit is tenfold where the gain in yield is threefold.

It generally requires from two to three years to thoroughly impress the farmer that this lesson of making a greater yield per acre is a practical method of farming applicable to his entire farm. The first year he rarely carries out the entire plan. He has not quite faith enough, or possibly the season is adverse, but he generally succeeds so much better than he expected that the second year's trial is more thorough, with a correspondingly increased gain.

The farmer is a natural doubter. When he has harvested the larger crop the second year, he is frequently inclined to attribute it to one thing, generally the seed, because this is most in evidence, instead of distributing the credit between the better seed bed, the better seed, and the intensive cultivation. Frequently his neighbors, full of the one-idea merit, offer $5 a bushel for the seed, thinking that the seed alone will make the crop. The third year the demonstration farmer is generally more of a convert and enlarges his trial area, frequently including his entire farm. In the meantime his neighbors have been observing and have commenced to inquire and follow his example.

It requires from three to five years to have the increased yield show a considerable average gain in the local markets. This depends, however, somewhat upon the number of demonstrations established in a county. Where one can be placed in each neighborhood the progress is rapid, because the interest soon becomes intense. If only one or two demonstration farms are established in a county, the work does not create interest enough to arouse public sentiment and produce at once a strong opinion in its favor.

As soon as the primary lessons, as above explained, have been accepted and tested by a farmer, a secondary series is commenced, which includes—

(1) Demonstrations in conserving and enriching the soil by the use of legumes and winter cover crops. These involve simple crop rotation and the turning under of green crops; also the prevention of soil waste by erosion.

(2) The value and uses of barnyard manures and commercial fertilizers, and how to apply them.

(3) Simple methods of farm drainage.

The third series of lessons relates to better pastures and meadows and how to secure them; the most economic grain crops for work animals or to produce flesh as a supplement to the pasture and meadow grasses. This line of instruction is necessary, because the economic production of farm crops depends in a great measure upon an economic support of the work teams.

The general method among the small farmers of the South was to depend mainly upon corn fodder and corn. Some had pastures, but rarely a good pasture. This method is expensive and causes a reduction in the number of animals kept for work to the smallest number possible and a corresponding substitution of hand labor. Modern methods of farming require considerable increase in the number and strength of teams. Profitable farming has become a team and implement problem. The improved pasture and cover-cured hay furnish foods of great economy and are sufficiently nutritious for the ordinary support of work stock. For heavy work a small addition of grain to the ration is required.

If it be necessary in the interests of economy to produce upon the farm the food for the work animals it is still more important to produce, as far as possible, the food required by all the laborers and their families. The family garden, the poultry, and the cow are great cash economizers and pocketbook conservers and may be classed with the better teams and tools as essential to better farm equipment.

FIELD SCHOOLS.

A very valuable method of instruction introduced by the demonstration work is the field school. Previous to the time the local agent of the work expects to visit a demonstrator he notifies all the cooperators in the vicinity to meet him there on a certain date at a given hour. Thus, a number of good farmers discuss the methods and, by comparison, place a value upon the work done. The same method is employed in the selection of seed corn. (See Pl. II, fig. 1.)

Plate II, figure 2, represents a meeting of farmers called to compare with each other the seed corn they expected to plant. Such is the isolated situation of the average farmer that he may continue for years to believe he has the best seed of the several crops he produces unless he is brought into direct public comparison and competition with other

farmers—not in a fair or exhibition where prizes are to be awarded and only the best specimens are brought, but in a mere exhibit of what the farmers expect to plant without any assorting. The farmers in the First Congressional District in North Carolina were invited to assemble in March, 1909, at central points and each bring about 50 ears of the seed corn they expected to plant. These ears were arranged on a long table in the public square, the owner's name being conspicuously attached to each pile. (See samples, Pl. III.) Expert judges were present to select and test. Some corn was brought that tested less than 45 per cent of fertile grains. At the close of the meeting over 90 per cent of the corn samples went for stock feed and was replaced by purchasing a better variety or quality.

BOYS' CORN CLUBS.

One of the greatest problems before the American people has been how to interest in rural life and attach to the farm the young man who has acquired a liberal education and displayed a capacity for leadership. The loss of rural leaders by emigration to the city has been one of the most serious retrogressive factors in our whole civilization. The Farmers' Cooperative Demonstration Work has solved the problem. These young men left the farm because they were repelled by the hardships, excessive toil, and meager gains on the farm and were allured by a seemingly greater opportunity to acquire wealth, influence, and position in the city. The demonstration work undertakes to create in the schoolboy a love of the farm and a new hope by showing the wonderful possibilities of the soil when properly managed and the ease with which wealth and distinction are achieved in rural life when science and art join hands. This is worked out by the cooperation of the demonstration workers, the county superintendent of public instruction, and the rural teachers.

The superintendent and teachers organize the schoolboys over 10 years of age into clubs (see Pl. IV, fig. 1); the demonstration work furnishes the plan of organization and the instructions (which the boys agree to observe); the respective parents furnish land, teams, and implements; the merchants and bankers provide the prizes, and the local papers give the publicity. Each boy must personally work 1 acre under the same regulations governing all other contestants. The result of 300 to 400 boys entering such a contest in a county arouses intense interest. The boy learns the best way to raise corn or cotton and his appreciation of the farm is greatly enhanced. (See Pl. IV, fig. 2.)

In 1909 the boys in the corn contest of one county in Mississippi averaged a production of 74 bushels of corn per acre, while the farmers averaged less than 20. In South Carolina one boy raised

152½ bushels on a measured acre, while the state average was less than 16.

INCIDENTAL TEACHING.

In addition to the demonstrations made to teach the best methods of securing the largest yields of field crops with the greatest economy, incidentally there is much instruction along the lines of rural improvement, the better home, its equipment and environment, the country roads, the school at the crossroads, rural society, etc. The average farmer takes it for granted that an agent of the Department of Agriculture is an authority upon all lines of husbandry, and innumerable inquiries are made of him about the dairy, the breeding and management of farm stock, horticulture, market gardening, insect pests, etc. All this incidental teaching is done without demonstration by referring the inquirers to the several bureaus in the United States Department of Agriculture, or request is made that bulletins covering the subject of inquiry be forwarded to them by mail.

In still another way the Farmers' Cooperative Demonstration Work is helpful. The many scientific divisions of the Bureau of Plant Industry are annually making discoveries of great value, and the problem has been how to get these to the farmers in a way so effective that they will adopt them. A bulletin does not do this with the average farmer. The agents of the Farmers' Cooperative Demonstration Work can place these improvements or discoveries in the hands of men who will utilize them to advantage because these agents are in touch with all the people. Thus the demonstration work is a means of disseminating information for all the bureaus of the Department that are close to rural life.

DEMONSTRATION WORK HELPFUL IN OTHER WAYS.

In the Southern States, where there are some white and many negro farmers who can not read, there is liable to sweep over a section a wave of depression amounting to a doubt about making a crop, which may cause a perceptible reduction in the acreage planted if the depression is felt prior to planting, or if later it may reduce the tillage of the crop or may result in its total abandonment. Nor is this wave of pessimism confined to the unlettered. Where crops are made on the advance system it may take such a hold of the merchant and the banker that they refuse to make the necessary advances, which forces the laborer and the tenant farmer to remove to territory where the advances can be obtained. In Harrison County, Tex., in 1907, about 500 tenants and laborers were preparing to abandon the farms after the cotton crop was up, through fear that they could not succeed in

making it. The same cause enormously reduced the cotton acreage in Louisiana and Mississippi in 1909. The agents of the Farmers' Cooperative Demonstration Work have been exceedingly influential in restoring and maintaining confidence among all classes.

TWO VIEWPOINTS.

The Farmers' Cooperative Demonstration Work may be regarded as a method of increasing farm crops and as logically the first step toward a true uplift, or it may be considered a system of rural education for boys and adults by which a readjustment of country life can be effected and placed upon a higher plane of profit, comfort, culture, influence, and power.

Because the first feature of this demonstration work is to show the farmer how he may more than double his crop at a reduced cost of production, it has been regarded by some solely as a method of increasing farm crops by applying scientific principles to the problem. This would be of great value to the world and would stand as a sufficient justification for the efforts put forth and the expenditures involved, but such a conception would fail to convey the broader purpose of this work.

There is much knowledge applicable and helpful to husbandry that is annually worked out and made available by the scientists in the United States Department of Agriculture and in the state experiment stations and by individual farmers upon their farms, which is sufficient to readjust agriculture and place it upon a basis of greater profit, to reconstruct the rural home, and to give to country life an attraction, a dignity, and a potential influence it has never received. This body of knowledge can not be conveyed and delivered by a written message to the people in such a way that they will accept and adopt it. This can only be done by personal appeal and ocular demonstrations. This is the mission of the Farmers' Cooperative Demonstration Work, and it has justified its claims by the results.

It is noteworthy that the sciences adopted the demonstration method of instruction long since. The chemist and the physicist require their students to work out their problems in the laboratory, the doctor and surgeon must practice in the hospital, and the mechanical engineer must show efficiency in the shop to complete his education. The Farmers' Cooperative Demonstration Work seeks to apply the same scientific methods to farmers by requiring them to work out their problems in the soil and obtain the answer in the crib. The soil is the farmers' laboratory.

The demonstration method of reaching and influencing the men on the farms is destined ultimately to be adopted by most civilized nations as a part of a great system of rural education.

FIG. 1.—MAN WITH MULE PLOWING, SHOWING OLD METHOD USED FOR BREAKING LAND IN THE SOUTHERN STATES—ONE ACRE A DAY THREE INCHES DEEP.

FIG. 2.—MAN WITH A DISK PLOW AND FOUR MULES PLOWING, SHOWING A LATER METHOD OF BREAKING LAND—THREE ACRES A DAY TEN INCHES DEEP.

FIG. 1.—CORNFIELD ON A DEMONSTRATION FARM, SHOWING A SCHOOL FOR FARMERS ENGAGED IN SELECTING CORN.

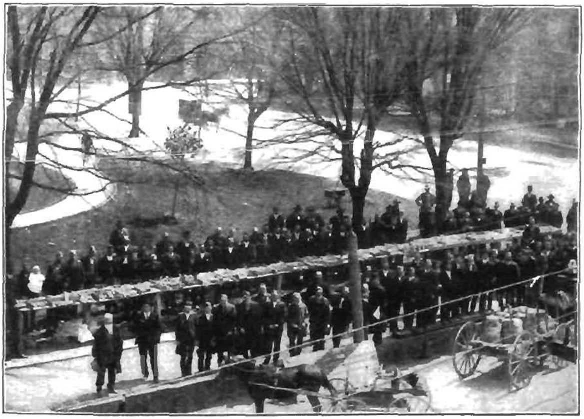
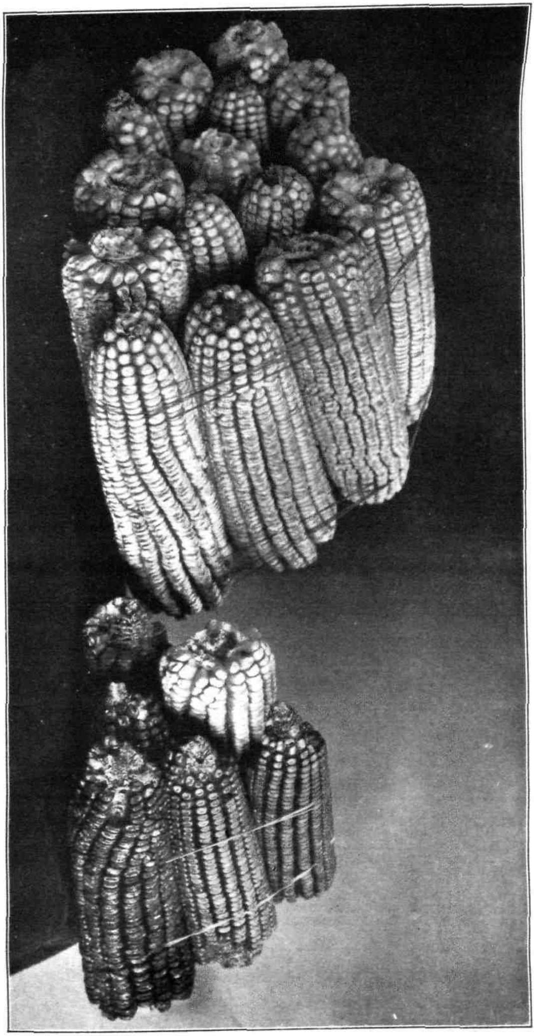


FIG. 2.—CORN DAY AT MONROE, N. C., SHOWING TWO HUNDRED FARMERS SELECTING AND TESTING CORN FOR PLANTING.



SAMPLES OF CORN SELECTED BY FARMERS FOR SEED. THE EARS ON THE RIGHT ARE THOSE SELECTED BY FARMERS IN A TERRITORY IN WHICH NO DEMONSTRATION WORK HAS BEEN DONE. THOSE ON THE LEFT WERE SELECTED BY FARMERS IN A TERRITORY WHERE DEMONSTRATION WORK HAS BEEN CONDUCTED ONE YEAR.

FIG. 1.—MEMBERS OF A BOYS' CORN CLUB AT TYLER, TEX. A REAL SCHOOL OF AGRICULTURE.

FIG. 2.—HOW TO MAKE A FARMER. THE BOY WHO GREW THE CORN SHOWN IS STANDING IN HIS DEMONSTRATION PATCH.

METHODS AND COSTS OF MARKETING.

By Frank Andrews,
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INTRODUCTION.

The difference between the amount received for a given product by the farmer and the price paid by the consumer is relatively much greater in some cases than in others. These variations in the expense of distribution are due partly to differences in the number of middlemen intervening between producer and consumer. For some products the trade is so well organized that few intermediate sales are made and the ultimate purchaser is but a step or two removed from the farmer, while for other products the course of distribution is long and costly. The various methods and costs of marketing are illustrated by instances reported to this Department by a large number of farmers and dealers throughout the country, and these illustrations form the basis of this article.

EXPENSES OF DISTRIBUTION.

TRANSPORTATION.

The costs of marketing farm produce include expenses incurred in hauling from the farm, freight, commission for selling, storage, inspection, weighing, interest on capital, profits of various dealers, and insurance. To these may be added the losses due not only to deterioration of products after they leave the farm, but also to unequal distribution of shipments resulting in overstocked markets.

Freight charges vary with different commodities and over different routes, so that conditions affecting one article should not be taken as illustrative of a class. With this limitation in mind, instances of freight costs of three of the most important farm products may be noted, namely, cotton, wheat, and cattle. On the basis of official estimates made in 1905, the average expense incurred by farmers in hauling cotton from farms to local shipping points was 16 cents per 100 pounds; the average railroad freight rate from these points to seaports was estimated at 40 cents; and the average ocean rate from the United States to Liverpool was 32 cents, making a total freight cost from farm to Liverpool of 88 cents per 100 pounds, or less than one-tenth of the farm value of the cotton. The averages for wheat in the same year were 5.4 cents per bushel for hauling from farms;

11.6 cents for railway charges from local points to all coasts, and an average ocean rate of 9.6 cents per bushel from Atlantic, Gulf, and Pacific ports to England; the total freight cost being 26.6 cents per bushel, or more than one-third of its farm value.

In the shipment of a number of commodities special expenses in addition to freight charges are incurred. The transportation of cattle requires an outlay for feed and attendance en route. The shipment of a carload of beef cattle from Kansas feed lots via Chicago to London included in 1908 railroad freight charges ranging from $8 to $13 per head, and ocean freight from $6.60 to $7.20 per head, while the feed and attendance en route averaged on the railroad from $1.50 to $2.50 per head, and on the ocean, on account of the longer time in transit, from $3 to $5 per head.

COMMISSION FOR SELLING.

Rates of commission for selling fruits and vegetables may range from 5 to 10 per cent of the gross proceeds of sales. A cooperative organization of farmers is sometimes able to retain part of this selling commission for its own use. The members of one southern fruit association paid for selling their products 10 per cent of gross proceeds, of which generally 6 per cent was given the northern commission dealer and 4 per cent was retained in the treasury of the association. There are numerous other instances of commissions based upon proceeds of sales, among which may be mentioned the charges for selling rice at New Orleans and clover seed at Milwaukee.

For selling grain and live stock at large markets the rates of commission are based generally upon the quantity sold and not upon proceeds of the sales. The rules of the Minneapolis Chamber of Commerce fix the rate for selling wheat, barley, or rye at 1 cent per bushel, corn or oats at one-half cent per bushel, and hay at 50 cents per ton. These rates apply to produce received under usual conditions. About the same charges prevail in other large markets.

In the tobacco warehouses of Virginia and North Carolina auctioneers' charges are determined by the number and weight of piles sold, and the "commission agents" who buy hops for wholesale dealers are frequently paid from one-fourth to one-half cent per pound.

A FEW SUMMARIES OF EXPENSE.

In June, 1909, a prominent exporter stated that the approximate cost of marketing wheat from North Dakota or Minnesota to a mill in England was about 22 cents a bushel. This cost included such items as the profit of the country elevator man in North Dakota or Minnesota, commission for selling at Duluth, elevator charges, fees for inspection and weighing, freight rates by rail and water, marine and other insurance, guaranty of outturn, and selling commission

at the foreign destination. Very little grain was moving at this time. In the busy season, when lake and ocean freight rates were higher, this exporter estimated the total cost of marketing over this route to be about 25 to 30 cents per bushel.

The cost of exporting cotton was estimated by a large dealer to average $6 per bale, under conditions existing in 1905. This amount included railroad freight from Texas local points to Galveston, ocean freight from Galveston to Liverpool, marine insurance, office expenses, interest, cartage, and selling commission. At Rocky Mount, N. C., in the season of 1908-9, the warehouse charges on tobacco are reported to have averaged about 5 per cent, and at Danville, Va., about 4 per cent of gross sales.

THE USE OF CAPITAL.

It is the rule for a farmer to sell his produce for cash, and consequently a considerable amount of money is required to supply those who buy directly from producers. A large part of the cash required to pay for crops is needed in the late summer and early fall, about the time of the grain harvests and the cotton picking. The farm value of the cotton produced in 1908 and of the wheat and corn which were shipped out of the counties where grown amounted to more than $1,250,000,000. This sum gives an idea of the amount of cash required to pay the farmers for the three crops mentioned, and most of it was needed within a few months after harvest. Another use of capital as an aid in marketing is when its possession enables the farmer to wait for good prices. The necessity of selling immediately after harvest often compels the producer to accept low prices.

A saving in the amount of capital required by a local buyer is effected when he collects promptly for each consignment. One way of collecting promptly is by the use of a draft, to which is attached the bill of lading for a consignment. The draft is drawn on the consignee and may be cashed at a bank. With the money thus received the consignor is enabled to make another purchase. This method of collecting promptly by drafts, to which the bill of lading and sometimes other shipping papers are attached, is in common use in the grain trade, both domestic and foreign, in the marketing of cotton and rice, in selling wool from western ranges, and, to a considerable degree, in the marketing of fruits and vegetables.

FINDING A MARKET.

SELLING IN TRANSIT.

One of the primitive ways of finding a market is for the farmer to go with his wares from house to house, or from store to store, making inquiry until a purchaser is found. An application of this simple plan is made on a large scale in the marketing of live stock.

A car of cattle consigned from a Kansas shipping point to Chicago may be unloaded and placed on sale at Omaha or Kansas City. In case no sale is made at one of these stopping places the stock is forwarded to Chicago. This practice is common on most of the important live-stock routes of the United States.

Grain also frequently changes hands at an intermediate market through which it passes, and the cars thus sold may be forwarded to destinations selected by the new owners. Regular quotations of prices are made at Chicago and other cities for grain in cars billed through to eastern markets from shipping points in the Middle West. Wheat raised in the Canadian northwest and shipped to the seaboard through North Dakota and Minnesota, for reentry into Canada by way of the Great Lakes, often changes hands at Duluth.

DIVERSION OF SHIPMENTS.

Another method of searching for a market is that of diverting a consignment to a destination other than the one first named in the shipping papers. An illustration of this is the practice common in the grain exporting business of the Pacific coast. It is usual for a cargo of wheat or barley sent from this coast to Europe to be consigned "for orders" to some port in the British Isles, as Queenstown, Falmouth, or Plymouth. After the vessel starts, the exporter tries to have a purchaser ready to bargain for the cargo when it reaches the port of call. The voyage around Cape Horn takes three or four months and this time is allowed the exporter for finding a suitable market. On its arrival at the port of call, the vessel receives orders as to the port at which the grain is to be discharged.

A similar plan is followed in shipping fruit by rail from California to the East. Two of the diversion points on these routes are Council Bluffs, Iowa, and Minnesota Transfer, a freight yard between St. Paul and Minneapolis.

Other important instances of this practice of diverting a consignment en route are afforded in the movement of fruits and vegetables from southern States. A commission firm, whose head office is in Pittsburg, distributes its marketings in this way. On receipt of a telegram, say, from a Georgia shipper announcing that he has a car ready to move, the head office of this firm decides at once the general direction for the car to go. If the West promises the best markets for the next several days, the shipper may be notified to consign to Cincinnati, or if the car is to go to an eastern city the consignment may be made to Potomac Yard, a freight transfer point on the Potomac River opposite Washington, D. C. At each of these diversion points a representative of the commission firm opens the cars, inspects the contents, and reports the results by telegraph or telephone to the Pittsburg office, which is kept informed of market conditions in different cities. The agent at the diversion point will

then receive orders as to the final destination of the car. Among the diversion points used for shipments of produce from the Southwest are Kansas City, St. Louis, and Chicago.

MARKET PLACES.

PUBLIC CITY MARKETS.—Public market places are established in a number of cities and towns and in these places consumers may buy such articles as fruit, vegetables, dairy products, poultry, and eggs direct from farmers as well as from dealers. In recent years there has been a tendency in some markets, as at Baltimore, Norfolk, and Washington, for practically all of the stalls to be used by dealers, while the producers occupy places along the neighboring sidewalks.

Market places are owned sometimes by city governments and sometimes by private corporations. In Washington, D. C., the largest markets are under private ownership, while in Baltimore the largest markets belong to the city. In York, Pa., there is one market owned by the city and five by private parties.

At some markets the only accommodations are those afforded by an open square, as one of the markets at Omaha, Nebr., and one at Richmond, Ind.; other places have open sheds, and still others are furnished with market houses. Some of the most noted markets of the United States are held under open sheds; the French Market in New Orleans and Lexington Market in Baltimore are both of this type. Among the numerous cities which have market houses are Pittsburg, Pa., Mobile, Ala., Buffalo, N. Y., Erie, Pa., Salem, Mass., Washington, D. C., Richmond, Va., Norfolk, Va., and Baltimore, Md.

The charges for space along the curb at some markets range from 10 cents to 75 cents per day for each wagon, and by the year from $10 to $50 or more. At Atchison, Kans., and also at San Antonio, Tex., a charge of 10 cents a day is made for each wagon occupying a place in the market, while at Buffalo, N. Y., the rate for a one-horse vehicle is 15 cents and for a two-horse wagon 25 cents per day, and at Norfolk, Va., these rates are respectively 10 and 15 cents. At Richmond, Ind., and Omaha, Nebr., spaces in the market are sold at auction to the highest bidder.

Producers sell in large quantities to dealers and deliver to commission men at public market places similar to the ones devoted to retail trade, and in many of the retail markets wholesale dealing is also done. The public market places of Omaha, New York, and Denver are used almost exclusively for wholesale trade, and so are wharf markets in Pittsburg, Baltimore, and Washington.

WAREHOUSES.—Another institution which aids the producer to dispose of his crop is the public warehouse. Illustrations of this are afforded in marketing tobacco in Virginia and North Carolina, wool from the northern Rocky Mountain States, and to some extent rice

in Louisiana and Texas. The growers, or their representatives, with their produce, meet the buyers at these warehouses. The method of operation in Virginia may be illustrated by the conditions at Richmond. The warehouses here are listed and market begins in the first one on the list for a certain day. After sales have been made in the first buyers go to the second, and so on throughout the list. Planters arrange their tobacco in piles along the floor of the warehouse, each pile being identified by a label or card attached to it. As the piles are auctioned off each buyer has some mark of identification attached to the pile purchased, and a record is made by the warehouse authorities. On leaving the warehouse the planter obtains his money from the warehouse manager, who in turn makes up a bill against each buyer for the total amount of tobacco he has bought that day. After the last warehouse sale has been made the market is continued at the Tobacco Exchange, where dealing is based upon samples displayed there. The importance of this system may be judged by the quantity of tobacco sold in these warehouses by farmers. The total sales by farmers at 21 Virginia markets having tobacco warehouses amounted during the nine months ending June 30, 1909, practically the entire season, to 116,000,000 pounds; and in the fiscal year ending July 31, 1909, the sales by planters in the warehouses of 45 North Carolina markets amounted to 142,000,000 pounds.

In selling rice at warehouses or on the New Orleans Board of Trade, sealed bids are submitted by the sellers and the sale is expected to be made to the highest bidder. In cities as far west as Chicago it is a common practice to sell fruit in warehouses which may be owned by railroads and used by auction companies. A consignment of California or Georgia fruit, for instance, will be sent to a commission merchant in New York, who will have the fruit sold to his account by the auction company.

Stock yards.—The largest wholesale market places open to the producers are the stock yards in such cities as Chicago, Kansas City, Omaha, and St. Louis. Sales in these stock yards may be made direct by the owner of the stock to the ultimate purchaser, but it is customary for transactions to be made through commission men.

DIFFERENT CLASSES OF MIDDLEMEN.

TRAVELING BUYERS.

Selling to buyers who come to the farm is practiced to some degree in many parts of the United States. Traveling hucksters in many regions go from farm to farm gathering eggs, butter, poultry, calves, and similar commodities, which they sell to shippers, jobbers, or retail dealers. Agents of large merchants go to farms on the Pacific coast to buy hops, to ranges in the Rocky Mountains for wool, to planta-

tions in Louisiana and southeastern Texas to bargain for rice, and to the orchards of the apple-producing States east of the Rocky Mountains. The cattle buyer also is a frequent visitor at many farms especially where stock raising is a secondary industry.

GENERAL MERCHANTS.

One of the most important persons in the distribution of some products is the merchant of the town or the rural community. He is often the first receiver of such products as eggs, farm-made butter, poultry, wool, hides, and sometimes cotton, grain, and hay. It was the custom a number of years ago, possibly more so than at present, for a local merchant to credit a planter of cotton or rice with supplies for a crop year, and to take a lien upon a growing crop to cover the value of the merchandise thus sold. In such a case it was frequently the custom for the crop when ready for market to be turned over to the merchant by the planter, who received the difference between his debt and the proceeds from the crop. The importance of the country merchant as a distributing factor in some regions is diminishing, for he has been supplanted to a greater or less degree by dealers in special products.

LOCAL BUYERS OF SPECIAL PRODUCTS.

In the regions where grain is a staple product the tendency has been for the storekeeper to be displaced by the grain dealer and the local elevator man. Among other examples of local buyers of special produce are the California fruit packer, who buys from growers; the egg and poultry shipper in the Middle West, whose purchases are made from country merchants and who ships by carload lots to wholesale dealers; the San Francisco wool merchant, who buys on the range and sells in the East; the poultry packer in the North Central States, who buys live fowls, slaughters them, and consigns to eastern cities; and the "track buyers" of watermelons in the region near San Antonio, Tex., of peaches in Georgia, and of hogs in the corn belt.

COMMISSION DEALERS.

The commission dealer is the agent through whom a large amount of produce is sold for farmers or country shippers. The commission man usually represents the seller, but there are instances where he serves as agent of the buyer, as in some sales of live stock to distant buyers or in the purchase of Pacific coast hops for eastern dealers.

In addition to serving as agent in making a sale, the commission man may advance money to a producer or to a country buyer, as when a live-stock commission firm loans money to feeders or when a grain-commission firm supplies a local grain dealer with sufficient cash to begin his season's purchases. Another phase of commission

dealing is that engaged in by rice and cotton factors, who advance money on crop liens, and to whom these products are frequently consigned to be sold on commission. In some States, for instance in South Carolina, banks are reported to be taking the place of the cotton factors in making loans, and the presence of buyers and neighboring mills enables planters sometimes to market their cotton without the aid of factors. Another class of factors are those in the Baltimore tobacco trade, who receive consignments, for instance, from farmers in Maryland and Ohio, and who sell to exporters.

EXPORTERS.

The exporter's business has some points in common with that of the local buyer in domestic trade; both classes of middlemen obtain their wares from sources relatively near at hand, and sell them in a distant market, either direct or through commission dealers. The exporter has to keep informed not only concerning the commercial regulations and market conditions of various countries, but also in regard to freight rates along the various lines of transportation over which his goods are apt to be carried. The fluctuations of freight rates, especially by water, make the cost of transportation lowest sometimes over one route and sometimes over another. In shipping wheat from Nebraska to Liverpool the grain may be sent through one of eight or ten large seaports ranging from Montreal around the coast to Galveston; and at a number of these ports tramp ships may be bidding against the regular lines for cargo. In case New York is selected as the port of shipment, the grain may be sent thither direct from Nebraska, or it may be transferred to a lake steamer at Chicago, to be reloaded at Buffalo either on canal boats or railroad cars.

In the grain business of the Pacific Northwest and in the cotton trade of the South it is not uncommon for the same firm that buys from the farmer to sell to the European miller. A grain exporter of Portland, Tacoma, or Seattle sometimes owns as many as 200 warehouses at different country railroad stations, and his agents at these stations buy direct from the farmers and consign to the seaport; while in Europe agents or correspondents of the same firm seek out buyers for the grain. But east of the Rocky Mountains the exporter of wheat, while he may sell through his representatives to foreign mills or dealers, in many instances does not buy either from the producer or the country grain dealer. His supply is often furnished by commission men or large dealers.

In addition to the five classes of middlemen just discussed, others of importance in the distribution of farm products are the jobber, who buys and sells in wholesale lots, and the retail dealer, the last of the series of middlemen who handle the commodity on its way from the producer to the consumer.

STEPS IN THE MOVEMENT FROM PRODUCER TO CONSUMER.

DIRECT SALES WITHOUT AID OF MIDDLEMEN.

Common instances of the producer selling direct and delivering to the door of the consumer occur in the marketing of milk, butter, eggs, poultry, fruits, vegetables, hay, and other farm products. Milk producers in the neighborhood of Erie, Pa., through their organization, deliver milk direct to consumers. Numerous poultry raisers sell exhibition stock direct to other poultry raisers. Eggs for hatching are also sold in this way. Registered cattle are often sold at auctions, held periodically by the owners. Retail sales of fruit, vegetables, poultry, eggs, and dairy products direct by producer to consumer are made also in public market places.

In a sense, a mill or a factory may be regarded as a consumer. An old instance of the producer selling in wholesale lots direct to the consumer is that of the farmer taking his grain to a near-by mill. A sale of sugar beets to a neighboring factory is another example of direct bargaining between producer and consumer; so is the sale and delivery of milk to a creamery, apples to an evaporating establishment, and fruits and vegetables to neighboring canning houses.

Selling at wholesale direct to consumer is illustrated also by a plan recently adopted by woolgrowers of the northern Rocky Mountain region. Large warehouses are established at Chicago and Omaha to which wool is consigned to be sold by the growers or their representatives. Manufacturers as well as dealers are among the buyers, so that part of the sales are made direct by the growers or their agents to consumers. Not only are direct sales by producer to manufacturer made in the warehouses, but on the range itself, for since the establishment of warehouses manufacturers and dealers have continued to send some of their buyers to the range.

One of the prominent woolgrowers of Wyoming reports that since the establishment of the large warehouses prices on the range have been much better. For the sake of supporting the warehouses the stockholders agree to pay into the association a certain percentage of their gross sales of wool, whether sold on the range or in the warehouses. This method of supporting a cooperative institution is adopted also by the Georgia Fruit Growers' Exchange.

TRANSFERS THROUGH ONE MIDDLEMAN.

A large number of transactions are made in which only one middleman assists in the transfer from producer to consumer. A common example is that of the town merchant who buys produce from farmers and sells it to consumers.

Among the other instances of a single middleman intervening between producer and consumer may be noted the commission man at a large market who receives consignments of live stock from farmers

and sells to packers; the factor to whom the planter consigns his rice or cotton and from whom purchases are often made by millers; the warehouseman who manages the sale of a Virginia planter's tobacco; and the "line," or system, of elevators, which buys grain from farmers and sells to millers. Pennsylvania tobacco is often bought at the farm by a dealer who sells to manufacturers.

It is a common practice in a number of cities—for instance, New York, Philadelphia, and Washington—for milk to be handled by one middleman, namely, the city retailer, who buys direct from the producer. A considerable part of the supply of New York City is delivered at country shipping points to stations or "creameries" owned by New York dealers, who sell in the city at retail.

An organization which brings the grain producer nearer the great mills is the farmers' elevator. The plan of its operation has some features similar to that of the wool warehouses of Chicago and Omaha. Farmers cooperate in building an elevator and in employing a manager.

MARKETING THROUGH TWO MIDDLEMEN.

The intervention of two middlemen between producer and consumer is a common occurrence. The farmer may consign to a distant commission man or sell to a local dealer, and the next transaction of the series may be the sale to a retail merchant whose customers are consumers. A common way of marketing live stock is for the farmer to sell to a buyer who ships to a commission merchant at a large packing center, where the animals are sold frequently to packers. Fruits and vegetables are marketed often through the aid of two middlemen, the city commission dealer and the retail merchant. Two middlemen are involved also in some sales of produce made by farmers' cooperative societies; the first, unless the sales manager of a society be classed as a middleman, being the wholesale or the commission dealer, and the second the retail merchant.

The milk supply of Boston is distributed largely through two successive middlemen, the wholesale and the retail dealer; and another series of two middlemen consists of the traveling huckster in Massachusetts and elsewhere, who buys poultry from farmers and sells to retail merchants. Hop growers of the Pacific coast frequently sell direct to commission men who buy for large dealers, and these dealers in turn make part of their sales to brewers.

TRANSACTIONS INVOLVING THREE OR MORE MIDDLEMEN.

A series of three middlemen may include, first, the local buyer or shipper; second, the commission dealer or the wholesale merchant; and third, the retail merchant. Watermelons from the region of San Antonio, Tex., are reported to be distributed in considerable quantities through such a series of dealers. Traveling hucksters in Missouri buy poultry from farmers and sell occasionally to merchants or

to commission firms, who in turn include among their customers some retail dealers. Apple dealers in this country purchase the fruit from growers and sell to United States agents of German importers. The third in this series of middlemen is the retail dealer in Germany.

In the sale of fruit by auction, as is common in large cities east of the Mississippi River, the auctioneer is an additional middleman. He may sell for a commission dealer to whom the consignment may have been made by a country buyer; and the purchaser at such an auction may be a jobber, who in turn sells to a retail merchant. Five middlemen are thus concerned in such a transaction.

Another instance of a long series of middlemen may be had in some exports of wheat from North Dakota to England. The grain may be bought first by a country grain dealer, consigned to a middleman at Duluth, bought there by an exporter, who in turn sells through his European agent to a foreign grain dealer. The last of the series of transactions may be the sale by the foreign merchant to the miller. Hay, in many parts of the country, is frequently bought by a local merchant who sells through a commission man to a wholesale dealer. Or again, the commission man may sell to an exporter who ships direct to an importer in Cuba, and one or more additional sales may be made before the hay reaches the last purchaser.

Onions raised in Kentucky are sometimes bought by a local merchant and shipped to Louisville; here they may be put in sacks and consigned to a New York wholesaler or a commission man, who in turn sells to a New York retailer. Eggs and poultry frequently pass through the hands of at least four middlemen.

The marketing of clover seed is an example of a transfer from one farmer to another through a number of middlemen. The first middleman may be an Indiana shipper who consigns to a commission dealer in Toledo; here the seed may be purchased by a merchant and shipped to a wholesale dealer in a distant city; the last middleman in this course of distribution may be a country storekeeper or a city dealer in agricultural supplies.

TERMS OF SALES.

Reference is made in other parts of this article to conditions affecting payments for produce. Cash payments, as has been said, are most general, but when a farmer is to make a delivery to a distant purchaser, it is often the practice for the payment to be made by means of a draft attached to a bill of lading. By selling for a definite price fixed before the sale is made, the farmer knows at the time of sale the exact amount he is to receive, but he may be at a disadvantage owing to lack of competition among buyers or to his failure to keep posted concerning market conditions. On the other hand, if he ships his produce to be sold on commission, he risks being disappointed with the proceeds of the sale.

Some of the disadvantages of selling at or near the farm are being overcome by improved conditions which open to the farmer other markets in case the one at home is not satisfactory. The use of the telephone enables him to know the latest market news, and the service of a cooperative selling association makes it easier for him to take advantage of favorable prices in distant markets.

Some produce is sold in advance of the harvest; for instance, in New York, Maryland, and Michigan vegetables are grown for canning houses under contracts made sometimes as early as the preceding midwinter. The terms of these contracts vary. According to some of them the canner furnishes the seed and fertilizer and agrees to make advances of money during the season and a final settlement at the end. Contracts providing for the sale of three successive crops at a fixed price are reported to have been made in 1908 with some hop growers of Washington and Oregon.

COOPERATIVE SELLING ASSOCIATIONS

The number of farmers' cooperative associations through which produce is marketed is increasing continually. Various fruits and vegetables, grain, tobacco, peanuts, rice, and other products are sold by the agents of such associations. In the State of Colorado alone there were in 1907 at least 33 such organizations and the products handled by them included cantaloupes, peaches, honey, potatoes, and miscellaneous fruits and vegetables. A number of California associations have united to form larger bodies through which sales are made, while the local organizations pack and load the produce.

At least two produce exchanges have been conducted successfully for a number of years by truck growers of the peninsula lying between the Chesapeake Bay and the Atlantic Ocean. The cranberry crop is marketed largely through farmers' organizations, and similar associations, too numerous to be listed here, are improving conditions of marketing in other parts of the United States. The extent to which the cooperative movement among farmers is distributed may be illustrated by the apples from Hood River, Oregon, which are marketed in this way; fruits and vegetables from Yuma Valley, Arizona; celery from Florida, cantaloupes from Tennessee, onions from central and western Texas, tobacco from Kentucky, grain from Minnesota and North Dakota, rice from Texas, peaches from Georgia, vegetables from Louisiana, and various articles from Michigan, in addition to a large number of products from California.

Two of the important results of cooperation in marketing have been the shipment of better grades of fruits and vegetables, and the command by the farmers of a greater influence in the market on account of large quantities of produce being controlled by a single authority.

CONDITIONS INFLUENCING THE PRODUCTION OF SUGAR-BEET SEED IN THE UNITED STATES.

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INTRODUCTION.

The sugar beet in its wild state along the shores of the Mediterranean Sea is for the most part an annual plant; that is, it generally produces seed the same season that the young plant begins its growth. Under domestication the sugar beet has become in the main a biennial; that is, two years are required to get a crop of seed when starting with seed, the roots being formed the first year and the seed stalks and seed the second season. Under certain weather conditions and methods of planting, our domestic sugar beets sometimes revert to the annual habit, but it has not hitherto been considered feasible to grow roots for sugar production and allow the same roots to produce a crop of seed the same season. While this, however, is not an impossibility and we have a project looking to the solution of this problem, this paper will deal mainly with the biennial beet from the standpoint of seed production.

It is not probable that a single strain of beet seed which may be produced will be equally satisfactory for all parts of the sugar-beet area, especially in a country where there is a great variation in soil and climatic conditions under which the seed must be used. It has already been demonstrated that high-grade sugar-beet seed can be produced in this country.[a] It is not the purpose of the United States Department of Agriculture to enter into the commercial production of sugar-beet seed, but simply to point out by study and experiment the localities and conditions under which seed of satisfactory quality and yield may be produced and to assist in so far as it is legitimate and practicable in developing, maintaining, and improving high-grade strains of sugar-beet seed.

DEMAND FOR BEET SEED.

The first requisite for the successful establishment and growth of the sugar-beet seed industry in this country is the demand for home-grown seed. This demand has already been created to some extent

[a] Tracy, J. E. W., and Reed, Joseph F. Circular No. 37, Bureau of Plant Industry, U. S. Dept. of Agriculture. 1909.

by the establishment and growth of the beet-sugar industry itself in the United States. We have in the United States at the present time 66 beet-sugar factories, each requiring on an average approximately 5,700 acres of beets for the usual run of one hundred days annually. Most of the factories are now recommending from 15 to 20 pounds of seed to the acre, since a good stand is of prime importance in producing a satisfactory crop of beets. This acreage and rate of planting create a demand at the present time for no less than *114,000* pounds of seed on an average for each factory per annum, or a total of approximately 7,500,000 pounds annually for all of the factories. The cost of the seed required at present is approximately $750,000. At a conservative estimate 1,200 pounds of beet seed to the acre may be taken as a fair average yield. At that rate upward of 6,000 acres of seed would be required annually to supply our present needs. Less than one-twentieth of this acreage is grown at present in this country, and considering the possibilities of sugar-beet growing it is safe to assume that the beet-sugar industry has only started in its growth and development. Each new factory which is put into operation in this country creates a demand for an additional 100,000 pounds or more of seed. With the development of the beet-sugar industry in other countries where beet sugar is now made and the extension of the industry into hitherto unproductive beet-sugar countries, the demand for seed is increasing at a rapid rate. In view of this rapidly increasing demand for sugar-beet seed, the *possibilities of producing home-grown seed and a study of its value* as compared with imported seed are questions worthy of careful consideration. From the standpoint of the American sugar-beet grower there seems to be no good reason why three-quarters of a million dollars should be sent abroad to pay for one of the prime necessities in sugar-beet culture.

PRODUCTION OF SUITABLE ROOTS.

When we realize that the beet-seed industry in this country is of first importance to the future development of beet-sugar production, *it remains for us to consider the various steps necessary for the* proper development of this new and promising industry and to study the natural conditions which may influence directly or indirectly its future development.

The first step in the production of high-grade seed is the production of roots of satisfactory shape, size, and quality. For seed production the size of the root may, under certain circumstances, be considered of minor importance, inasmuch as the size of the root depends to some extent upon the conditions under which it is grown. If, however, the root remains small under conditions favorable to its growth—that is, if the root is inherently small—its size becomes

an important factor in the production of satisfactory beet seed. The size of the roots in the varieties of sugar beets ordinarily used does not vary to any marked extent when the beets are grown under similar conditions.

As regards the shape of the beet, attention should be given not only to the part below the surface of the ground, but also to the crown. Plate V, figure 1, gives a fairly typical form of a seed beet. It is well proportioned and of satisfactory weight. If the suture along the side of the root were twisted so that the feeding roots formed a spiral it would be nearer the ideal; but the fact should be emphasized that the really ideal root is very hard to find. It will be noted that the main root in the figure carries its size well down toward its middle portion and that it then gradually tapers to a point. This form of root is especially important from the standpoint of tonnage, without losing its ability to maintain a high sugar content. The crown, which has had some of the lower leaves removed, is not abnormally large, nor is it of the small and "pinched" type, which is very poor in seed production. It is important to guard against abnormally large roots grown in a more or less isolated position, inasmuch as such roots are usually poor in sugar. It may be possible to develop a large beet rich in sugar, but this is a special line of work in which we are already engaged and which will not be discussed at the present time.

A study of the roots produced in any part of the sugar-beet belt of the country will readily convince one that roots of satisfactory shape, size, and quality for seed production may be found in practically every section of this area. It is not uncommon in some sections for the yield of roots to exceed 20 tons to the acre, nor for the sugar content to range from 18 to 22 per cent under favorable conditions, with a purity coefficient of from 85 to 90. With these facts well established through a careful study of beet roots grown in various parts of the sugar-beet belt for a series of years, it is safe to assume that beet roots of good size and quality for seed production are grown in this country each year. Whether or not the climatic conditions are such that a satisfactory yield and quality of seed will be produced can, as a rule, be determined only by actual test.

IMPORTANCE OF CLIMATIC CONDITIONS IN SEED PRODUCTION.

Wind, temperature, and precipitation are important factors in seed production. While a certain amount of wind is useful in distributing the pollen during the flowering period, a strong wind after the seed is set is frequently very destructive in that it breaks the seed stalks, causing considerable loss, since the seed on the broken stalks fails to mature. It is also very detrimental to the development of the

seed if the roots are loosened in the ground, as sometimes happens in certain soils in case of a high wind. Close planting, so that the stalks of adjacent plants support each other, will overcome the destructive action of the wind to some extent. Wind-breaks may also be used to good advantage.

High temperature, especially if accompanied by hot dry winds at the time the seed is forming, is very detrimental, frequently causing many of the flowers to become blasted and resulting in empty hulls, which greatly reduce the yield of seed and the profitableness of the crop. The probability of such conditions occurring should be considered in selecting a locality for the growing of beet seed.

Precipitation in the form of rain at the time the seed is harvested or after it is cut and while it is still in the field will usually darken the seed coats and may cause the seed to mold. Precipitation in the form of hailstorms may occur at any time during the growing season and ruin the entire crop. These storms are more prevalent in certain localities than in others; hence, this point should be considered when selecting a place for beet-seed production. The wide range of climatic conditions under which sugar beets are successfully grown in this country would indicate that a number of localities can easily be found where the climatic conditions unfavorable for seed production are at a minimum.

DISEASES IN RELATION TO SEED PRODUCTION.

Several diseases of the sugar beet have an important bearing upon the quality and quantity of the seed produced. The most important of these are curly-top, root-rot, and crown-rot. It has been found that curly-top will hold over the winter in the seed beets, and even beets that are apparently healthy at the time of siloing, if taken from a field containing beets affected with curly-top, may show decided symptoms of the disease the second season. Such plants produce little, if any, seed. A more detailed account of this disease in its relation to seed production will be found in Bulletin 122 of the Bureau of Plant Industry. The object in mentioning the disease here is to warn beet-seed growers against selecting seed beets from fields where curly-top occurs.

All roots showing any sign of root-rot or crown-rot should be discarded when the roots are selected in the fall. If this matter is overlooked, the disease will not only hold over and destroy the plants originally infected, but it may spread in the silos and cause an enormous loss. It would therefore be a wise plan to make no selections from fields where these diseases occur.

A number of species of insects are sometimes more or less destructive to seed beets at different stages of their development. An

account of these insects will be found in Bulletins 40, 43, and 66, Part IV, of the Bureau of Entomology.

METHODS OF SILOING.

One of the most serious problems which confronts the would-be beet-seed grower is that of keeping his beets through the winter in good condition. Having selected the roots with reference to size, shape, and sugar content, it is important that a method should be found by which these roots may be kept so that they will go through the winter in the most satisfactory condition for planting in the spring. We have tested during the past several winters a large number of methods of siloing seed beets, including storing in pits, trenches, bins, cellars, etc., in which various covers are used, and find that the so-called sand method gives the most satisfactory results. By this method the roots are entirely embedded in sand, either with or without the use of a pit or trench. We have usually siloed on the surface of the ground, simply placing one layer of the beets on a slightly elevated portion of the field, so that the drainage is good, covering this layer of roots with a good layer of sand, then adding another layer of beets, and then another layer of sand, etc., until all the roots are placed in a suitable pile or silo, covered with sand and then with the required amount of earth to keep them from freezing. The sand should be slightly moist, so that the roots will not wilt.

In our earlier experiments we followed one of the customary methods, shown in Plate V, figure 2, in which the beets were piled on the ground without sand or other material to fill the spaces between the roots, and the piles covered with straw or burlap, after which sufficient earth was added to hold the straw or burlap in place and prevent freezing. This method was satisfactory from the standpoint of protection from cold, provided just enough covering was added to prevent freezing without causing the roots to heat. The difficulty of heating was sometimes encountered, however, if too much covering was added. But the greatest source of loss in connection with this method arose from the fact that the beet piles with their numerous openings formed excellent places for field mice to winter, as shown in Plate V, figure 2. These mice fed upon the roots, usually attacking them at the crown and destroying the buds, thus frequently rendering a considerable number of the roots useless for seed production. The sand method overcomes this latter difficulty very completely and the roots come out in the spring clean and crisp. Some seedsmen prefer to place the roots in an upright position rather than to lay them on their sides. This seems to be merely a matter of convenience in handling and does not affect the quality or quantity of the seed produced.

Siloing in sheds, either in bulk or in bins or trays, has not given the desired results in keeping the roots in good condition for seed production. Under such conditions too much evaporation usually takes place from the roots, producing in them a wilted condition, which is far from ideal in roots which are to be used for seed production. If a root cellar is available, as it was in some of the tests, a combination of cellar and sand method is to be recommended, although this usually requires an extra handling. Siloing with and without leaves—that is, with or without removing the tops—has been tried repeatedly, and in most cases the removal of the tops before siloing is to be recommended, inasmuch as the leaves frequently decay and cause the roots to rot. It is claimed by some growers, however, that a richer and better beet is obtained by leaving the tops on, and this may be done where climatic conditions will permit. It is doubtful, however, whether this adds anything to the inherent value of the beets for seed production.

On the whole, it is much easier to keep the roots in a cold than in a very warm climate. If the temperature is low it is necessary only to add sufficient covering to prevent freezing, whereas if the temperature during the winter months is high it is extremely difficult to prevent growth from taking place without covering the roots with too much earth or other material, thereby causing them to heat. Whether or not seed production in warm climates would be of sufficient importance to warrant cold-storage methods or shipment of the roots to a very cold climate for storage, to be shipped back again at the proper time for planting, is a question that must depend upon the extra cost and upon the yield and quality of the seed produced under such conditions, as would also the method of growing the roots in one section to be shipped to another to be planted out for seed production. These are details that depend upon local conditions which affect cost and returns for seed produced. It is possible to keep roots in a climate as mild as southern California, as our experiments have demonstrated, and to produce from them a good yield and quality of seed by exercising great care in covering the roots in the fall.

TESTING THE ROOTS.

Testing the roots is one of the most important steps in the production of beet seed, since the value of the seed depends not only upon its quality from the standpoint of germination, but also upon the ability of the roots produced to store a maximum quantity of sugar with a minimum quantity of salts. With our present knowledge of seed production the standard of high-grade seed can be maintained only by the most careful and most rigid testing and elimination of

all roots that are not of a satisfactory quality. Having selected roots of suitable size and shape, a typical core is removed by means of a drill which is passed through the beet at an angle, as shown in Plate VI, figure 1. This core is tested for sugar by the usual polariscope methods. The ability of a seed grower to maintain high quality in the root is one of the most important conditions in the establishment and maintenance of the beet-seed industry.

There is a great deal of confusion in the minds of plant breeders regarding the real purpose of the selection of the roots from the standpoint of sugar content. Careful observation would seem to indicate that breeding and selection for high sugar content have to do mainly with the elimination of those individual roots that will not respond readily to favorable conditions of soil and climate with respect to the formation and storage of sugar, and the preservation and perpetuation of those roots that will respond to those conditions. High sugar content, therefore, does not seem to be a fixed character in the same sense as are color, form, etc., but will vary to a marked degree when the conditions of growth are changed. For example, seeds from the same plant when planted in different parts of the country have been known to produce roots having a difference of more than 7 per cent in the sugar content, while the shape, color, and general habits of growth remained the same. The importance of selecting the seed for sugar content can not be overestimated; and, because of the importance of this work and the difficulties attending it, sugar-beet seed growing can be carried on successfully only with special equipment, by the exercise of the greatest care, and consequently at considerable expense.

PLANTING THE SEED BEETS.

The ground to be used for seed beets should be put in condition for planting as early in the spring as weather conditions will permit. The soil, which must be well drained, should be plowed to a good depth and worked down until it is in such condition that it will settle firmly and evenly around the roots when they are planted. As soon as the ground is ready and weather conditions will permit, the seed beets should be taken out of the silos preparatory to planting. If the roots were not tested in the fall this work should be done as soon as possible after the silos are opened in the spring.

It should be noted that the planting of the roots can be done, as a rule, much earlier than the seed planting, owing to the fact that the old plants are much hardier than the seedlings. In case any injury has occurred during the winter, either through decay or by the action of field mice in destroying the buds, the beets should be sorted and only the sound and perfect ones used for seed production. These

should be taken to the field in wagons and distributed from baskets or other convenient carriers and dropped in rows at intervals of from 2 to 3 feet, the rows being likewise from 2 to 3 feet apart. The field should have been previously marked in both directions in the same manner that a field is marked for planting corn. The distance between the roots when planted will depend upon the size of the roots, the habit of growth of the seed stalks, and certain weather conditions. If the roots are small they may be planted closer than large roots, providing there is no likelihood that the seed stalks will be branching and bushy. The habit of growth of the seed stalks is in part due to inherited tendencies, but it may be controlled to a considerable extent by the method of topping: the closely topped roots usually produce the more bushy seed stalks. This point is made clear in Plate VI, figure 2, and Plate VII. Selections should be made with a view to securing beets having a proper seed-stalk development, as shown in Plate VII, figure 2, rather than the poor yielders shown in Plate VI, figure 2, the producer of small seeds, or the extremely undesirable type which produces a small quantity of seed late in the season.

The principal weather condition influencing the distance between the roots is the wind. If there is danger of strong winds at the season of the year when the seed stalks have formed and the seed set, close planting will enable the seed stalks to support each other and thereby to withstand to some extent the effect of the wind, already indicated. The injurious effect of the wind in loosening the roots in the ground, thereby causing the plant to wilt, the seed to shrivel, or a failure to fill, can not be too strongly emphasized. The nature of the soil and the methods of cultivation and irrigation will also have some bearing upon the distance between the roots. It should be remembered that when the conditions permit planting the roots only 2 feet apart, more than twice as many roots can be planted on an acre of ground as when the roots are planted 3 feet apart, which results in an economy of space as well as of labor in caring for the plants.

After the roots have been dropped as previously indicated they are planted by means of a long spade. This is forced into the ground perpendicularly to a depth a little greater than the length of the root to be planted. The spade is then pushed forward and the root thrust into the ground just back of the spade. While the beet is held in this position the spade is withdrawn and the root remains in the ground, just flush with the surface of the soil or very slightly below the surface. The dirt is packed around the root with a slight covering of earth over the top of the beet. Care should be taken to place the beets in an upright position, which is very readily done after

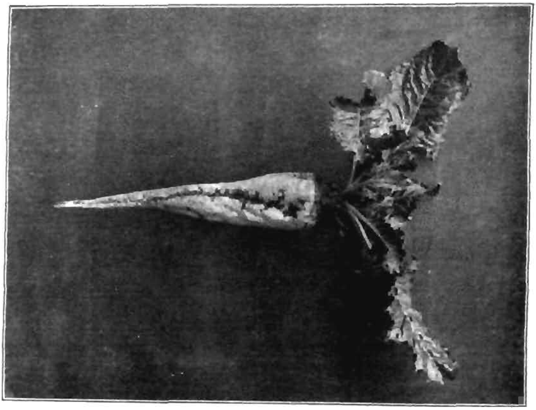

FIG. 1.—A FAIRLY GOOD TYPE OF SEED BEET.

FIG. 2.—A COMMON TYPE OF SILO FOR SEED BEETS.

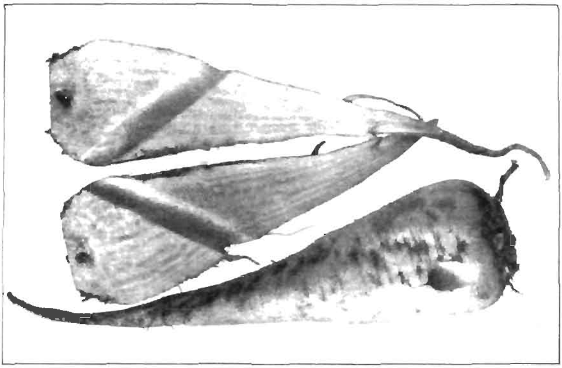

FIG. 1.—SEED BEETS, SHOWING METHOD OF TESTING FOR SUGAR.

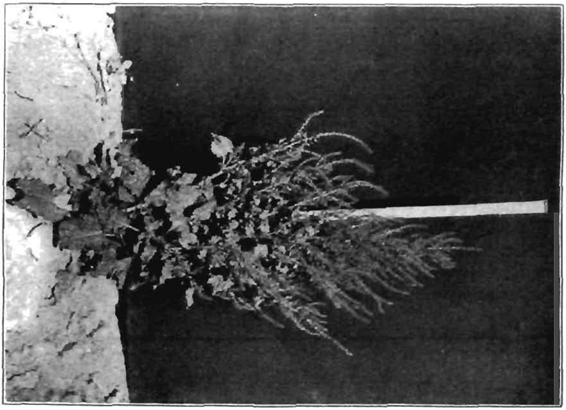

FIG. 2.—A TYPE OF SEED BEET PRODUCING A STRONG CENTRAL STEM.

FIG. 1.—AN UNDESIRABLE TYPE OF SEED STALK FROM THE STANDPOINT OF YIELD.

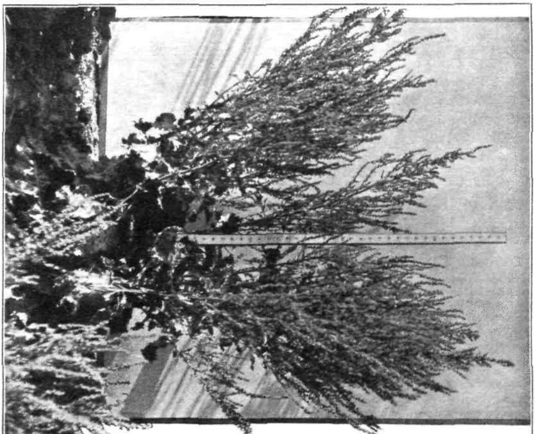

FIG. 2.—A TYPE OF SEED STALK OF GOOD YIELD AND QUALITY.

a little experience with the spade. If the roots are placed horizontally, or even at a considerable angle in the ground, they do not do so well in the way of seed production as when planted in an upright position. It is necessary, therefore, that careful oversight be given to this operation in beet-seed production.

CARING FOR THE SEED BEETS.

The ground should be thoroughly cultivated between the rows in both directions, in order to keep down the weeds and to conserve the moisture as much as possible. The cultivation should not be too deep, nor should it be close enough to the main root to loosen it or in any way disturb the growth of the feeding roots, as roots so injured seldom recover. The soil close to the beet should be hoed from time to time for the same reasons that the ground is cultivated, namely, for the destruction of weeds and for the conservation of moisture. Extreme care should be exercised to avoid cutting the roots or loosening them in the ground. In the irrigated sections of the country the seed beets should receive one or two irrigations. They seem to require an unusual quantity of water at the time the seed is forming, and the withholding of water at that time very greatly reduces the yield and quality of the seed. After the seed has set it should be allowed to ripen by withholding the water, and further cultivation is not necessary. In the rainy sections the moisture is not so easily controlled and the result may be a more uneven ripening of the seed. The pollination of the flowers is an important factor in the formation of the seed and is usually carried on by the wind and insects, without any artificial aid. If it is desired, therefore, to make any crosses between particular plants, it is necessary that they should be protected from the action of the wind and insects, either by covering them with material through which the pollen grains can not pass or by separating them by long distances.

It has been the practice in some localities to remove a portion of the center branch, in order to give the side branches greater vigor by throwing the growth into these remaining portions of the plant. This is thought by some growers to greatly increase the yield and quality of the seed. Others claim that a greater yield and equally good seed may be obtained without removing the center branch or stalk. Undoubtedly the results in each case depend upon local conditions, quality of the roots, and general branching habit of the plant.

GATHERING THE SEED.

After the seed has reached full growth it assumes a yellowish tinge, which gradually deepens and finally changes to a light-brown color. The yellowing of the seed indicates that it is approaching

the time of maturity. It should be watched closely at this time, and when it is thoroughly ripe, but before it begins to shell, the stalks should be cut close to the ground. They may then be placed in upright shocks or laid upon the ground. Excessive moisture in the form of rain at this time is likely to cause a molding and darkening of the seed, which may or may not injure its germinating quality, but which very materially injures its selling quality, as the market demands a clear bright seed. When the seed is thoroughly dry it is loaded on wagons and hauled to some suitable place, where it is passed through a thrasher, which knocks the seed from the stalks.

CLEANING AND CURING THE SEED.

Naturally in the process of thrashing the seed large numbers of immature seeds and pieces of the seed stems and leaves are broken off and pass over with the seed. These must be removed before the seed is marketable. Cleaning is accomplished by two operations: (1) By fanning, which removes any light material, such as immature seeds and florets; (2) by passing the seed over a rotating canvas inclined at such an angle that as the canvas rotates the seeds pass down the incline, while the stalks and bits of broken seed stalks and leaves are carried over into the trough or hopper. After the seed is cleaned it should be thoroughly dried, so that it will not mold. Some seed growers have artificial driers, but the desired result may be reached by spreading the seed on a level floor and stirring it at frequent intervals with a rake or other convenient implement.

MARKETING THE SEED.

After drying, the seed is placed in large sacks, usually 100 pounds to the sack, and is then ready for shipment or market.

In developing seed for which there has not been a previous demand it is necessary that the reputation of the seed be thoroughly established. This can be done only by using the seed side by side with well-known standard varieties. If a new seed is grown in comparison with standard varieties for several seasons, and under varying conditions is equal to the so-called standard varieties, it is fair to assume that it is a good variety of seed, that it has been well bred, and that it is certainly worthy of introduction into localities where a high-grade seed is required. It must necessarily take some years to establish the reputation of a seed among growers, so that it will be looked upon as one of the leading varieties. Growers become attached to certain varieties because they have used them with more or less satisfactory results, and it is frequently with difficulty that they are induced to give up a variety which they have used for a number

of years for the exclusive use of a new variety. This change is usually brought about gradually, but if the new variety is well established and bears out its reputation as a producer of good tonnage and quality it will gradually win a place in a large number of the sugar-beet sections. It is important, therefore, that the producer of the seed be a man of good reputation for straightforward business ability and that he realize the importance of the greatest care and strictest selection in the propagation of his seed from year to year. The beet-seed industry is one that has received from only a few seed growers the attention from a practical standpoint that its importance would seem to demand in this country. It is just now receiving more than usual attention, and great care should be exercised in starting the work of seed production along the right lines and continuing it with all possible care until a sufficient quantity of seed of the highest grade is produced to supply the demand of the American sugar-beet growers.

INFLUENCE OF LABOR AND TRADE CONDITIONS ON SEED PRODUCTION.

In considering the conditions which influence the production of beet seed in the United States, we must reach the conclusion that the natural factors of soil and climate are favorable in a number of sugar-beet localities to the successful production of sugar-beet seed. The most serious difficulties to be overcome are to be found in connection with the labor and trade problems. The high price of labor, as well as the scarcity of every kind of farm labor, is hampering not only the beet-seed industry, but many other agricultural enterprises. The sugar-beet sections of the country are greatly in need of more labor, and in a great measure of more intelligent and reliable labor. This labor must be drawn from foreign countries or from the congested centers in this country. Probably the uncertainty of continuous employment in the country is one of the most potent factors in this connection. Inability to obtain permanent employment in the rural districts has undoubtedly deterred many of the better class of laborers from seeking employment in the country. If by any means an assurance of permanency could be given, there is little doubt that plenty of labor would find its way to the farms and ranches.

While the labor condition is no more serious in its relation to the beet-seed industry than in its relation to other field crops, it is natural for men to hesitate in regard to the investment of capital in new agricultural enterprises involving considerable labor under existing conditions.

Two conditions influence the trade in beet seed: (1) The high transportation rates from place to place in the United States as compared with the low transportation rates from Europe, and (2) the

fact that many people who influence the purchase of beet seed in the various sugar-beet localities in this country are interested directly or indirectly in the sale of imported seed. These difficulties are not insurmountable, and, when we compare them with the many conditions favoring the production of home-grown beet seed, it is fair to say that this new industry, which has already gained a foothold in this country, will develop until the importation of sugar-beet seed is the exception instead of the rule.

PLANTS USEFUL TO ATTRACT BIRDS AND PROTECT FRUIT.

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INTRODUCTION.

Birds play a very important part in the economy of nature, and by their destruction of insects lend material aid in keeping the balance true. Both the farmer and the orchardist are greatly indebted to birds for the destruction of insects and weed seed, and nowhere is the nature and extent of this indebtedness more fully appreciated than in the United States. In every part of our broad land also are lovers of birds whose pleasure is in large part measured by the number of feathered acquaintances each season brings. Both for practical and esthetic reasons, therefore, there is a demand for information as to the best method of increasing the bird population in restricted areas, particularly on the farms and about homes. There is a demand also for the provisioning of large preserves for both land and water game birds and the protection of crops by cultivating seed and fruit bearing plants more useful to birds than to man.

Various other factors may be made to contribute to the success of efforts to attract birds, such as a supply of water for drinking and bathing, nesting boxes, protection from enemies, and winter feeding; but the main purpose of this article is to call attention to the plants which best serve to provide food for birds and to draw their attention away from cultivated crops.

PLANTS USEFUL FOR ATTRACTING FRUIT-EATING BIRDS.

A large variety of shrubs and trees are cultivated for ornament in the United States, but in most cases it is evident that they have been planted with no thought for the needs of birds. Our native shrubs should be utilized as far as possible, especially as many of them are not exceeded in beauty or interest by foreign plants. Furthermore, as a rule they are more attractive to birds than exotics. It should be borne in mind also that smoothly trimmed hedges and the stiff trees of a formal garden are not nearly so attractive to birds as untrained bushes and tangled thickets. Shrubs of sterile varieties or those closely pruned after blooming are not sought by birds, while those allowed to ripen fruit are often crowded with feathered visitors. Moreover, plants clustered with fruit of varying color are

more beautiful and interesting than those which exhaust their energy in one burst of bloom and are of monotonous appearance thereafter.

The best shrubs and trees for attracting birds are those most resorted to for food, and the extensive records of bird food in the Biological Survey make their selection an easy task. The berries of elders (*Sambucus*) are eaten by the largest number of species of birds, namely, 67. Raspberries and blackberries (*Rubus*) are known to be eaten by 60 species, mulberries (*Morus*) by 48, dogwood fruits (*Cornus*) by 47, those of the nonpoisonous sumachs[a] (*Rhus*) by 44, the various wild cherries (*Prunus*) by 39, and blueberries (*Vaccinium*) by 37. This completes the list of fruits known to be chosen by more than 30 species of birds. Following these in order are wild grapes (*Vitis*), eaten by 29 species; pokeberries (*Phytolacca*), by 26; Virginia creeper berries (*Psedera*), bayberries (*Myrica*), and juniper berries (*Juniperus*), by 25 species each; service or June berries (*Amelanchier*), by 20; holly berries (*Ilex*), by 19; strawberries (*Fragaria*) and fruits of viburnums, by 16 each; hackberries (*Celtis*) and huckleberries (*Gaylussacia*), by 15 each; haws (*Cratægus*), by 12; spicebush berries (*Benzoin*) and rose hips (*Rosa*), by 11 each; and the fruits of sarsaparilla (*Aralia*), sour gum (*Nyssa*), gooseberries and currants (*Ribes*), and snowberry (*Symphoricarpos*), each eaten by 10 species of birds.

In addition to the plants recommended on the basis of proved preference by birds, as indicated by stomach examination, there are several other genera known to furnish much bird food, or which are important in certain regions where none of the plants just mentioned are abundant. Separation of this list from the above by no means indicates inferiority for the purpose of attracting birds, but is done only to emphasize the different criteria for selecting them. These plants are: Manzanita (*Arctostaphylos*); barberry (*Berberis*); buffalo berry (*Shepherdia*); silverberry (*Elæagnus*); buckthorn (*Rhamnus*); mountain ash (*Pyrus*); china berry (*Melia*); the California Christmas berry (*Heteromeles arbutifolia*); the pepper tree (*Schinus molle*), the fruit of which is a splendid bird food in southern California; magnolia, the pulp-coated seeds of which furnish one of the most nutritious and eagerly sought foods of birds wintering in the Southeastern States; and nockaway (*Ehretia*), lote bush (*Zizyphus*), and bluewood (*Condalia*), three favorite genera of the Southwest, where most of the plants previously mentioned are wanting.

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[a] It must not be understood that birds avoid the poisonous sumachs—in fact they feed upon them more extensively than upon the innocuous ones. But these plants, which are poisonous to so many people, can not, for obvious reasons, be recommended for cultivation. Another favorite bird food which it is undesirable to propagate is mistletoe.

Species of the genera listed can be selected that furnish adequate bird shelter and also a continuous supply of fruit throughout the year in any part of the United States where cultivation of trees and shrubs is practicable. It is most important to have a sure supply of bird food for late winter and early spring. The quantity of natural food is then smallest, and frequently the few remaining sources are rendered inaccessible by snow and sleet. It is advisable, therefore, for bird lovers to make liberal use of plants which retain their fruit through the winter. They will be well repaid, for a dependable food supply is never a more potent bait than at this bleak season. Among the plants much patronized by birds, those which hold their fruit longest are juniper, bayberry, hackberry, barberry, magnolia, mountain ash, rose, Christmas berry, china berry, pepper tree, sumach, holly (*Ilex opaca*), black alder (*Ilex verticillata*), certain wild grapes (notably the frost grape, *Vitis cordifolia*), manzanita, snowberry, and some evergreen species in other genera, such as the evergreen blueberry (*Vaccinium ovatum*) of the Pacific coast region, farkleberry (*Vaccinium arboreum*), and evergreen cherry (*Prunus caroliniana*) of the Southeastern States. In some localities the Virginia creeper holds its fruit, in others dropping it readily.

The plants with persistent fruit bridge the gap between the overwhelming abundance of autumn and the scarcity of early spring. Before the last of the wintered-over fruit disappears, a few plants have blossomed and begin to mature the first fruits of another season. Among the earliest of all and greatly relished by birds, are mulberries. They ripen in April—even in late March in southern localities—and in May and June farther north. Red-berried elder and service berries are but little later; often the latter are not left on the trees by the hungry birds long enough to ripen. Wild strawberries, raspberries, and dewberries are early and may be used to protect cultivated species. Certain kinds of cherries, as the European bird cherry (*Prunus padus*) and the mahaleb or stock cherry (*Prunus mahaleb*), ripen their fruit at about the same time as domestic cherries and will serve to divert the attention of birds. From the time summer is well started there is a constant abundance of wild fruits. Blueberries, huckleberries, certain dogwoods, viburnums, and grapes are among the first to ripen and fall, while sarsaparilla, elder, gooseberries, currants, spicebush, and sassafras are somewhat more persistent. Other dogwoods, silverberry, sour gum, and black cherry hold their fruit a little later, and pokeberry, hawthorn, buffalo berry, some wild grapes, and viburnums retain their fruit well into the winter, though they seldom last as well as the characteristic winter fruits named above.

Evidently there need be no season without its fruit if judicious selection of shrubs and trees is made by those desiring to attract birds. Thus a thicket of raspberry or dewberry, elder, and dog-

wood, grouped about some taller sumac, Juneberry, and juniper, would supply fruit throughout the year. Moreover, in almost any part of the United States, this combination can be made by the use of native species alone.

The problem that confronts the prospective planter of trees and shrubs to attract birds is the selection of the species most suitable for his particular locality. By reference to the descriptions below it is possible in most cases to determine the life zone to which his locality belongs. Then, from the corresponding list of trees and shrubs (given below) the species best suited to that area may be learned. The lists are by no means complete; usually but a single species of a genus is mentioned, when perhaps half a dozen or more are available. It is attempted, however, in every case to name the most satisfactory species, having due regard to its value as bird food and to its wide distribution and hardiness in the area named.

The Canadian zone is the warmest or southernmost division of the Boreal region and the most northerly life zone of agricultural importance. It "comprises the southern part of the great transcontinental coniferous forest of Canada, the northern parts of Maine, New Hampshire, and Michigan, a strip along the Pacific coast reaching as far south at least as Cape Mendocino, in California, and the greater part of the high mountains of the United States and Mexico. In the East it covers the Green Mountains, Adirondacks, and Catskills, and the higher mountains of Pennsylvania, West Virginia, Virginia, western North Carolina, and eastern Tennessee. In the mountains of the West it covers the lower slopes in the north and the higher slopes in the south. In the Rocky Mountain region it appears to reach continuously from British Columbia to west central Wyoming; and in the Cascade Range, from British Columbia to southern Oregon, with a narrow interruption along the Columbia River." [a]

Plants useful for attracting birds in that part of the Canadian zone east of the Rocky Mountains are:

Juniper (*Juniperus communis*), black currant (*Ribes lacustre*), mountain ash (*Pyrus americana*), Juneberry (*Amelanchier canadensis*), blackberry (*Rubus canadensis*), red raspberry (*Rubus strigosus*), choke cherry (*Prunus virginiana*), bird cherry (*Prunus pennsylvanica*), sumach (*Rhus glabra*), buffalo berry (*Shepherdia canadensis*), sarsaparilla (*Aralia nudicaulis*), bearberry (*Arctostaphylos uvaursi*), dwarf bilberry (*Vaccinium cæspitosum*), hobble bush (*Viburnum alnifolium*), red osier (*Cornus stolonifera*), and elders (*Sambucus canadensis* and *S. pubens*).

In the Rocky Mountain region and westward the following species are available:

Western juniper (*Juniperus occidentalis*), currant (*Ribes viscosissimum*), mountain ash (*Pyrus sitchensis*), service berry (*Amelanchier alnifolia*), evergreen blackberry (*Rubus vitifolius*), cherry (*Prunus emarginata*), buckthorn

[a] Merriam, C. Hart. Life Zones and Crop Zones of the United States. Bull. 10, Biological Survey, p. 15, 1898.

(*Rhamnus alnifolia*), the same bearberry, bilberry, red osier, and buffalo berry as above, snowberry (*Symphoricarpos acutus*), and elder (*Sambucus melanocarpa*).

"The Transition zone * * * is the transcontinental belt in which Boreal and Austral elements overlap. From New England to the northern Rocky Mountains its course is fairly even and regular, but west of the Great Plains it is tortuous and irregular. The zone as a whole is characterized by comparatively few distinctive animals and plants, but rather by the occurrence together of southern species which here find their northern limit and northern species which here find their southern limit. It may be subdivided into three faunal areas, which, although grading into one another, are in the main strikingly different: (*a*) An eastern humid or *Alleghenian area;* (*b*) a *western arid area;* (*c*) a *Pacific coast humid area.* * * *

"The eastern humid or Alleghenian area comprises the greater part of New England, southeastern Ontario, New York, Pennsylvania, Michigan, Wisconsin, Minnesota, eastern North Dakota, northeastern South Dakota, and the Alleghenies from Pennsylvania to Georgia."[a]

In the Alleghenian faunal area the following species of fruit-bearing shrubs may be used to attract birds:

Red cedar (*Juniperus virginiana*), mulberry (*Morus rubra*), pokeberry (*Phytolacca decandra*), barberry (*Berberis vulgaris*), sassafras (*Sassafras variifolium*), spice bush (*Benzoin æstivale*), black currant (*Ribes floridum*), mountain ash (*Pyrus americana*), service berry (*Amelanchier canadensis*), blackberry (*Rubus villosus*), raspberries (*Rubus occidentalis* and *R. strigosus*), black cherry (*Prunus serotina*), choke cherry (*Prunus virginiana*), sumach (*Rhus glabra*), black alder (*Ilex verticillata*), buckthorn (*Rhamnus caroliniana*), Virginia creeper (*Psedera quinquefolia*), frost grapes (*Vitis cordifolia* and *V. vulpina*), fox grape (*Vitis labrusca*), sarsaparilla (*Aralia nudicaulis*), dogwood (*Cornus alternifolia*), bearberry (*Arctostaphylos uvaursi*), dangleberry (*Gaylussacia frondosa*), blueberries (*Vaccinium corymbosum* and *V. pennsylvanicum*), snowberry (*Symphoricarpus racemosus*), sheepberry (*Viburnum lentago*), and elders (*Sambucus canadensis* and *S. pubens*).

"The western or arid division of the Transition zone comprises the western part of the Dakotas, northern Montana east of the Rocky Mountains, southern Assiniboia, small areas in southern Manitoba and Alberta, the higher parts of the Great Basin and the plateau region generally (except the Boreal Mountains), the eastern base of the Cascade-Sierra system, and local areas still farther west, in Oregon and California, where it merges into the humid Pacific Coast division."[b]

The sage hen, sharp-tailed grouse, and green-tailed towhee are characteristic birds; that is, their range is practically confined to the arid Transition area. Many other species occur, however, and those desiring to attract them will find the following shrubs and vines serviceable:

Juniper (*Juniperus scopulorum*), barberry (*Berberis repens*), currant (*Ribes cereum*), service berry (*Amelanchier florida*), red raspberry (*Rubus strigosus*), choke cherry (*Prunus demissa*), aromatic sumach (*Rhus trilobata*), grape

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[a] Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 20, 1898.

[b] Ibid., p. 25.

(*Vitis californica*), silverberry (*Elæagnus argentea*), buffalo berry (*Shepherdia argentea*), red osier (*Cornus stolonifera*), snowberry (*Symphoricarpus racemosus*), and elder (*Sambucus glauca*).

"*The humid Pacific Coast division of the Transition zone* comprises the western parts of Washington and Oregon between the coast mountains and the Cascade Range, parts of northern California, and most of the coast region of California from near Cape Mendocino southward to the Santa Barbara Mountains. To the south and east it passes into the arid Transition, and in places into the Upper Sonoran."[a]

The Pacific Coast Transition faunal area produces a wealth of fruit-bearing shrubs, among which the following are suitable for attracting birds:

Bayberry (*Myrica californica*), red flowerlug currant (*Ribes sanguineum*), service berry (*Amelanchier florida*), evergreen blackberry (*Rubus vitifolius*), blackcap (*Rubus leucodermis*), cherry (*Prunus emarginata villosa*), buckthorn (*Rhamnus californica* and *R. purshiana*), dogwood (*Cornus occidentalis* and *C. glabrata*), manzanita (*Arctostaphylos tomentosa*, *A. glandulosa*, and *A. canescens*), evergreen blueberry (*Vaccinium ovatum*), snowberry (*Symphoricarpus racemosus*), and elder (*Sambucus glauca*).

"The Upper Austral zone may be divided into two large and important faunal areas—an eastern humid or Carolinian area and a western arid or Upper Sonoran area, which pass insensibly into one another in the neighborhood of the one hundredth meridian. * * *

"The Carolinian faunal area * * * occupies the larger part of the Middle States, except the mountains, covering southeastern South Dakota, eastern Nebraska, Kansas, and part of Oklahoma; nearly the whole of Iowa, Missouri, Illinois, Indiana, Ohio, Maryland, and Delaware; more than half of West Virginia, Kentucky, Tennessee, and New Jersey; and large areas in Alabama, Georgia, the Carolinas, Virginia, Pennsylvania, New York, Michigan, and southern Ontario. On the Atlantic coast it reaches from near the mouth of Chesapeake Bay to southern Connecticut and sends narrow arms up the valleys of the Connecticut and Hudson rivers. A little farther west another slender arm is sent northward, following the east shore of Lake Michigan nearly or quite to Grand Traverse Bay. These arms, like nearly all narrow northward prolongations of southern zones, do not carry the complete faunas and floras of the areas to which they belong, but lack certain species from the start and become more and more dilute to the northward till it is hard to say where they really end. Their northern boundaries, therefore, must be drawn arbitrarily or must be based on the presence or absence of particular species rather than the usual association of species."[b]

Native shrubs and trees useful for attracting birds in the Carolinian faunal area are:

Red cedar (*Juniperus virginiana*), bayberry (*Myrica cerifera* and *M. carolinensis*), hackberry (*Celtis occidentalis*), mulberry (*Morus rubra*), pokeberry (*Phytolacca decandra*), sassafras (*Sassafras variifolium*), spice bush (*Benzoin æstivale*), black currant (*Ribes floridum*), Juneberry (*Amelanchier canadensis*),

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[a] Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 27, 1898.

[b] Ibid., pp. 30–31.

blackberry (*Rubus villosus*), raspberry (*Rubus occidentalis*), black cherry (*Prunus serotina*), sumach (*Rhus glabra* and *R. copallina*), black alder (*Ilex verticillata*), buckthorn (*Rhamnus caroliniana*), Virginia creeper (*Psedera quinquefolia*), frost grape (*Vitis vulpina*), summer grape (*Vitis aestivalis*), fox grape (*Vitis labrusca*), sarsaparilla (*Aralia nudicaulis*), dogwood (*Cornus asperifolia*, *C. florida*, and *C. alternifolia*), sour gum (*Nyssa sylvatica*), dangleberry (*Gaylussacia frondosa*), blueberries (*Vaccinium corymbosum* and *V. vacillans*), snowberry (*Symphoricarpus racemosus*), viburnum (*Viburnum acerifolium* and *V. prunifolium*), and elder (*Sambucus canadensis*).

"The Upper Sonoran faunal area * * * of the Western States and Territories is the arid-land continuation of the Carolinian area of the more humid Eastern States. * * * Beginning in the neighborhood of the one hundredth meridian, it covers most of the great plains in eastern Montana and Wyoming, southwestern South Dakota, western Nebraska, Kansas, Oklahoma, and Texas, and eastern Colorado and New Mexico. In Oregon and Washington it covers the plains of the Columbia and the Malheur and Harney plains; in California it encircles the Sacramento and San Joaquin valleys and forms a narrow belt along the eastern boundary of the Colorado and Mohave deserts; in Utah it covers the Salt Lake and Sevier deserts; in Idaho, the Snake Plains; and in Nevada and Arizona, irregular areas of suitable elevation."[a]

The following plants are recommended for use in this region:

Juniper (*Juniperus monosperma* and *J. californica*), hackberry (*Celtis reticulata*), mulberry (*Morus rubra*), barberry (*Berberis fendleri*), golden currant (*Ribes aureum*), service berry (*Amelanchier utahensis*), red raspberry (*Rubus strigosus*), choke cherry (*Prunus demissa*), aromatic sumach (*Rhus trilobata*), buckthorn (*Rhamnus tomentella* and *R. smithi*), Virginia creeper (*Psedera quinquefolia*), red osier (*Cornus stolonifera*), manzanita (*Arctostaphylos manzanita* and *A. viscida*), snowberry (*Symphoricarpos racemosus*), and elder (*Sambucus glauca*).

"The Lower Austral zone occupies the southern part of the United States, from Chesapeake Bay to the great interior valley of California. It is interrupted by the Continental Divide in eastern Arizona and western New Mexico, and is divided, according to conditions of humidity, into an eastern or *Austroriparian* and a western or *Lower Sonoran* area.
* * * "The Lower Sonoran area begins with the arid region of Texas in the neighborhood of longitude 98°, and stretches westerly to the Rio Grande Valley, in which it sends an arm northwest to a point a little north of Albuquerque, N. Mex. Another arm reaches up the valley of the Pecos. West of the Rio Grande Valley in New Mexico the Lower Sonoran is interrupted by the Continental Divide. It begins again in eastern Arizona and sweeps broadly westward below the high plateau, covering southern and western Arizona, the deserts of southern Nevada and eastern California, and the San Joaquin and Sacramento valleys."[b]

The Lower Sonoran faunal area has few native fruit-bearing shrubs and trees, but some of them are of more than ordinary value as bird food. The following, including several extralimital species

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[a] Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 36, 1898.

[b] Ibid., p. 41.

tested by the New Mexico Agricultural Experiment Station (and distinguished by an asterisk), are recommended:

Hackberry (*Celtis reticulata** and *C. pallida*), barberry (*Berberis hæmatocarpa** and *B. trifoliata*), golden currant (*Ribes aureum**), cherry (*Prunus copallina**), sumach (*Rhus mexicana* and *R. microphylla*), bluewood (*Condalia oborata, C. obtusifolia,* and *C. spathulata*), lote bush (*Zizyphus obtusifolius*), grape (*Vitis arizonica*), Virginia creeper (*Psedera quinquefolia**), nockaway (*Ehretia elliptica*), elders (*Sambucus mexicana** and *S. glauca*). *Lycium berlandieri* and *andersoni*, and some of the pad cactuses, notably *Opuntia engelmanni* and *lindheimeri*.

"The Austroriparian area occupies the greater part of the South Atlantic and Gulf States. Beginning near the mouth of Chesapeake Bay it covers half or more than half of Virginia, North and South Carolina, Georgia, Florida, Alabama, the whole of Mississippi and Louisiana, eastern Texas, nearly all of Indian Territory, more than half of Arkansas, and parts of Oklahoma, southeastern Kansas, southern Missouri, southern Illinois, the extreme southwestern corner of Indiana, and the bottom lands of western Kentucky and Tennessee."[a]

"The Gulf strip, or southern part of the Austroriparian area, reaches from Texas to southern Florida, covers a narrow strip in southern Georgia, and probably follows the coastal lowlands northward into South Carolina."[b]

For the purposes of this article the whole Austroriparian faunal area, including the Gulf strip, may be considered together as the humid division of the Lower Austral, all of which lies east of the one hundredth meridian. In this region many cultivated plants thrive that do so nowhere else in the eastern United States, and some of them are valuable for attracting birds. But there are plenty of native fruit-bearing shrubs and trees also, of which the following are recommended:

Red cedar (*Juniperus virginiana*), bayberry (*Myrica cerifera*), hackberry (*Celtis occidentalis* and *C. mississippiensis*), mulberry (*Morus rubra*), magnolia (*Magnolia grandiflora* and *M. virginiana*), sassafras (*Sassafras variifolium*), spicebush (*Benzoin æstivale*), dewberry (*Rubus trivialis*), black cherry (*Prunus serotina*), evergreen cherry (*Prunus caroliniana*), sumach (*Rhus copallina* and *R. glabra*), holly (*Ilex opaca*), buckthorn (*Rhamnus caroliniana*), Virginia creeper (*Psedera quinquefolia*), grape (*Vitis vulpina* and *V. æstivalis*), pepper vine (*Ampelopsis arborea*), hercules club (*Aralia spinosa*), dogwood (*Cornus asperifolia* and *C. florida*), sour gum (*Nyssa sylvatica*), huckleberry (*Gaylussacia dumosa*), farkleberry (*Vaccinium arboreum*), blueberry (*Vaccinium corymbosum*), viburnum (*Viburnum rufotomentosum* and *V. nudum*), and elder (*Sambucus canadensis*).

Besides native shrubs and trees, a number of cultivated species have proved so attractive to birds that they are as important as any of the indigenous fruits. An excellent example is the pepper tree (*Schinus molle*), which flourishes in southern California, and which will probably thrive in many other parts of the Lower Sonoran faunal area. Others suited to the same climate are the china berry

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[a] Merriam, C. Hart. Life Zones and Crop Zones of the United States, Bull. 10, Biological Survey, p. 45, 1898.

[b] Ibid., p. 49.

(*Melia azedarach*), the Russian mulberry (*Morus alba tatarica*), and the Russian oleaster (*Elæagnus angustifolia*). The china berry is just as successful in the eastern part of this zone, namely, in the Austroriparian faunal area; it retains its fruit through the winter and is eagerly sought by robins, cedar birds, and catbirds. The Russian oleaster and another species (*Elæagnus umbellata*) also do well here and furnish an abundance of fruit relished by birds. *Elæagnus angustifolia* and *Melia* are hardy at Washington, D. C., also, which is in the Upper Austral zone. The fire thorn (*Cotoneaster pyracantha*), a beautiful shrub with scarlet berries much liked by birds, will grow almost anywhere in the eastern United States, and the Parkman apple (*Pyrus halliana*), one of the handsomest flowering apples, is quite hardy, and is a valuable bird food, with fruit persistent in winter. But foremost in attractiveness to birds among cultivated fruit-bearing plants are mulberries. These will grow almost anywhere in the United States, and their combined early ripening and long fruiting season make them especially valuable. Varieties of mulberries suited to the various faunal areas will be treated at greater length in the section devoted to plants useful for protecting cultivated crops.

FOOD PLANTS FOR SPARROWS.

A hundred species of sparrows inhabit the United States, and in the number of individuals they outrank any other family. Many of them are characteristic winter birds, and as they are great destroyers of weed seeds and are sprightly and cheery withal, it pays to take considerable trouble to attract them.

As just remarked, they love weed seeds and do great good by destroying them; but as it is not desirable to cultivate weeds, the next best thing is to plant harmless species of their favorite genera. Fortunately many common ornamental garden plants which are entirely dependent on cultivation fulfill all requirements and produce in abundance seeds which are highly relished by sparrows. To these may be added a few native species which are not bad weeds, and the various millets, which are excelled by no other plants in attractiveness to seed-eating birds. The following are recommended for sparrows and other birds liking small seeds:

Love-lies-bleeding (*Amaranthus candatus*), princes feather (both *Amaranthus hypochondriacus* and *Polygonum orientale*), yellow chamomile (*Anthemis tinctoria*), chamomile (*Anthemis nobilis*), *Calandrinia umbellata*, bachelors button (*Centaurea cyanus*), African millet (*Eleusine coracana*), California poppy (*Eschscholzia californica*), tarweed (*Madia elegans*), miners lettuce (*Montia perfoliata*), millet (*Panicum miliaceum*), Japan barnyard millet (*Panicum crusgalli* var.), German millet or Hungarian grass (*Setaria italica*), and sunflower. Several of the species of sunflower will serve, the common sunflower (*Helianthus annuus*) being one of the best, having named varieties especially prized for the abundance and large size of the seed. No seeds are more relished by graminivorous birds than the millets; in fact, they are so much preferred that they have been used with good effect for drawing the attention of birds from more valuable grain crops.

FOOD PLANTS FOR UPLAND GAME BIRDS.

The distinction between the dietaries of the so-called frugivorous and graminivorous birds is not so marked as would be inferred from a strict interpretation of these terms. Particularly in the case of the grouse and quail does a limited characterization of the food habits fail to express the truth. Consequently in recommending plants attractive to these birds many must be mentioned that are included in the lists for fruit-eating birds. Grouse are fond of both buds and leaves; hence some plants which have neither nutritious fruit nor seeds are for them important food plants.

While the establishment of preserves for land game birds is yet a new movement in this country, it is certain to become of great importance. Hence it is desirable to disseminate information as to the food and covert plants that are favored by the grouse and quail. Bobwhites frequently use covers of rose, alder, and blackberry bushes, and thickly set barberry, bayberry, and dense banks of honeysuckle are suitable. These plants also furnish food for the birds, but they should be supplemented by others more exclusively adapted for this purpose. Sumach, Japanese clover, buckwheat, sorghum, millet, vetches, cowpeas, and any plants of the pea family producing small seeds are valuable, and should be sown in large quantities. The seeds of milk pea (*Galactia*), partridge pea (*Chamæchrista*), hog peanut (*Falcata*), wild bean (*Strophostyles*), and smartweeds (*Polygonum*) are important natural foods of the eastern quail, but should be encouraged only where they can not become weed pests. The western quail are fond of the seeds of sumach, bur clover, alfilaria, lupines, napa thistle, and turkey mullein plants; but where these plants are liable to become nuisances the food plants recommended for the eastern quail will serve.

Coverts for grouse, as the sharptail, should abound in such plants as rose, sumach, blueberry, bearberry, buffalo berry, dwarf birch, and alder. The ruffed grouse thrives among scrub oak, bayberry, rose, sumach, dwarf birch, alder, poplar, willow, and such fruit-bearing plants as partridge berry, hawthorn, viburnum, wild grapes, mountain ash, blueberry, blackberry, and cranberry. Cover of this nature is suited to the heath hen also, and to the imported pheasants and the Hungarian partridge, but in all cases it is well to supplement the food supply furnished by these shrubs and trees by planting small grains and legumes as recommended for quail.

PLANTS USEFUL FOR PROTECTING CULTIVATED FRUITS.

The practice of planting wild or inferior fruits for the purpose of tolling birds away from valuable cultivated varieties is very old, but it has never been tried as widely and systematically as seems desirable.

The chief essential to the success of this plan is that the decoy trees shall be early bearing species, for almost all of the damage to fruit by birds is inflicted on the earliest varieties, evidently because of the scarcity of early wild fruit. Probably cherries, raspberries, and strawberries suffer more in the aggregate than all of the later fruits. Fortunately we have a fruit which fills this need, one which ripens with the earliest cherries and is a favorite with all frugivorous birds, namely, the mulberry, both native and cultivated.

Three varieties of the native mulberry (*Morus rubra*), namely, the Hicks, Stubbs, and Townsend, are especially successful in the Southern States, though the Hicks is known to thrive in the Carolinian faunal areas and Stubbs in the Alleghenian. The Townsend is a comparatively new variety and its hardiness is unknown, but it ripens fruit remarkably early and should be given a thorough trial. According to Prof. L. H. Bailey, the New American (often sold under the name Downing) is the best mulberry known for the Northern States. The Russian mulberry is the hardiest variety and is a favorite in the plains region and other places where great extremes of temperature prevail. It succeeds in as diverse climates as those of North Dakota and New Mexico. The New American, Russian, and Black Persian mulberries are known to do well in California, and the indications are that the latter is suited to conditions in the Lower Sonoran faunal area. When planting mulberries for the purpose of protecting cultivated fruits, the earliest fruiting varieties obtainable should be used.

Among fruits suitable for the same purpose, but not now known to be as valuable as mulberries, are the mahaleb or stock cherry (*Prunus mahaleb*) and the European bird cherry (*Prunus padus*). Among native fruits the only ones that can be recommended at present are the service berry or Juneberry (*Amelanchier*), redberried elder (*Sambucus pubens*), and wild strawberries and raspberries. Patches of the earliest varieties of these small berries are very attractive to birds.

Injury to later fruits, except in localities where there are no wild fruits, is more difficult to prevent, as in such cases it probably arises from preference by the birds for a particular cultivated fruit. Thus grapes suffer seriously in some places. The always reliable mulberries are useful even at this season, as some varieties continue in bearing from two to six months. Elderberries are probably the most valuable native fruit for attracting birds in the summer and fall, particularly in the West, where they have a long fruiting season. In the North and East no summer fruits are more attractive to birds than the black cherry (*Prunus serotina*) and choke cherry (*Prunus virginiana*).

CONCLUSION.

Nothing surpasses mulberries for alluring birds away from the early orchard fruits. Early bearing varieties should be planted in numbers and some should be selected for the length of the fruiting season. The Hicks and the Black Persian are notable in the latter respect, while the Townsend is earliest for the South and the Russian for the North.

Where it is desired to attract birds and afford them a sanctuary at all seasons, a large variety of plants must be used. For this purpose thickets of shrubs and other low growths are better than trees, since tangles of bushes and vines afford a more secure retreat from bird enemies and are the favorite cover of many species.

Where birds occur in large numbers their enemies are sure to congregate. Hence grounds especially designed to attract birds should also be furnished with devices to insure security from cats and other predatory animals. Fences made proof against climbing invaders by overhanging wire netting are essential, and inverted funnel-shaped metal guards or loose spirals of barbed wire should be placed around the trunks of nest trees to protect the occupants. Bird houses of various types add to the possibilities of bird gardens, and a never-failing supply of water is an essential. The basin should be shallow, so as to serve both for bathing and drinking, and should be placed in an open lawn or elevated so that birds resorting to it will not be at the mercy of enemies. Assured safety and a plentiful supply of food and drink will work wonders in attracting birds.

THE PROBLEMS OF AN IRRIGATION FARMER.

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INTRODUCTION.

Our rapidly increasing population is undergoing a widespread readjustment. The continued high price of foodstuffs is intensifying interest in agricultural production, with a consequent demand for additional producing areas. The stimulus of high prices has been felt in the East as well as in the West, but the West, with its larger resources of undeveloped land and water, its more salubrious climate, and its more diversified agricultural possibilities, has attracted more attention among home seekers and those who would gain an agricultural livelihood. The Western States are therefore entering upon an era of extraordinary agricultural development.

Since much of this western country is arid, its agricultural development involves irrigation. Irrigation is an art until recently but little practiced in American agriculture or, indeed, in the European countries, whence our agricultural people and practices have come. As a result, the agricultural development of the West presents many problems and difficulties new alike to the individual and to the race. Of these problems, some are immediate and acute, while others are more remote and unappreciated though no less vital to the ultimate welfare of the West and the people who inhabit it.

The Federal Government is taking an active part in the irrigation development of the western United States under the authority of the reclamation act of June 17, 1902, which provides for the use of money derived from the sale of public lands in the construction of irrigation works. Such works have been started on some thirty projects and a few have been completed, and the lands are now being taken up by settlers.

In connection with this work of the Reclamation Service, the Department of Agriculture has undertaken an investigation of the agricultural problems on several of these new projects. The investigations at present under way deal chiefly with crops and crop problems, tillage methods, crop rotations, and the establishment of new

crop industries. It is in connection with these investigations that the problems here considered have been brought out.

In the past, and even recently, large profits have been made from crop production on irrigated lands. In the majority of these cases there have been unusual combinations of circumstances, which are likely to occur in the future with increasing rarity. Irrigation tends to insure but one factor—water supply—in the farmer's complicated equation. A regular water supply by no means insures safety in other directions. It does not insure protection from hail, frost, cyclones, plant disease, or insect pests. Nor does it guarantee high prices for crops or a cheap and adequate supply of labor. The great majority of home seekers on irrigated lands must be content with a fair living instead of immediate wealth.

IRRIGATION A NEW PROBLEM IN AMERICA.

Though irrigation was practiced by the prehistoric inhabitants of western America long before the European discovery of the continent, its adoption by European settlers dates back little more than half a century. In fact, no considerable progress in irrigation had been made prior to the present generation of western farmers. Thus, while the experience of these farmers may serve as a guide and a warning to the beginner at the present day, the larger experience gained in other lands must aid in the solution of many problems that are being encountered.

Ancient remains show that there flourished in western North America in pre-Columbian times an irrigated agriculture of considerable extent and importance. It is most unfortunate that no history of this earlier period of irrigation has been preserved, so that we might draw upon the experience of those earlier people for guidance in taking up anew the task of conquering the desert. Indistinct ditch lines and vague traditions are all that remain to tell us what lands and what waters they found good and what bad. It remains for us to work out for ourselves the problems of soils, crops, alkali, and drainage, as well as the no less essential problems of cooperation, farm implements, markets, and transportation.

CAPITAL AND EXPERIENCE ESSENTIAL.

Farming either with or without irrigation is an extremely complicated art which looks much simpler than it really is. Irrigation farming has often in the past yielded rich returns, but it is not to be expected that every effort will duplicate the results of the most famed localities. The present outlook does not appear less promising

than the past, but the past also shows that bright prospects may be overemphasized by those who have irrigated lands to sell.

Western irrigated lands are being settled largely by people from the East, and a surprisingly large number of these settlers come from cities and towns and bring with them little capital, either in money or in agricultural experience. To the true pioneer a lack of experience or money is not an insurmountable obstacle. In time he will get at least the experience. True pioneers may come from towns and cities as well as from the country. Unfortunately, however, many people who have failed to make a livelihood in eastern cities are encouraged by extravagant advertisements to believe that certain prosperity awaits them on irrigated farms in the West, that failure is *impossible, and that no experience and but little money is required* for a start. Yet it would be incorrect to say that a man can not start an irrigated farm and succeed without experience and even without money. This has been done and can doubtless be done again; but such success is won only at the cost of heroic perseverance and through the endurance of hardships and privations that test the courage of the strongest. For every farmer who succeeds under these circumstances many will fail. Nor does failure result alone from lack of money or of agricultural experience. Even farmers who move from the East or the Middle West to western irrigated lands have much to learn, and not infrequently they are slower to appreciate this fact than their brothers from the city, who have an earlier realization of their own ignorance and begin at once the accumulation of local knowledge.

Any settler in a new region may save himself many costly errors by a preliminary study of local agricultural practices. It is often true that local practice is not the best, and the newcomer may himself in time be instrumental in improving it, but it is the part of wisdom to approach this reformation cautiously.

DIVERSITIES OF IRRIGATED LANDS.

Western irrigated lands represent a diversity of conditions not exceeded in all the rest of agricultural America. They include the hot, dry valleys of the Southwest, where rain and frost are almost equally unknown, as well as the high, cool valleys in the mountains, where winter snows lie deep and summer frosts are not infrequent. Some of the irrigated lands are to be found on the extreme Pacific coast, where the climate of winter and summer differs chiefly in the amount of rainfall rather than in the change of temperature, and on the eastern slope of the Rocky Mountains, where the annual ex-

tremes of temperature are as great as anywhere in the country. From the groves of oranges and date palms to the mountain meadows, with their single crop of hay each season, one may find irrigation practiced. Each locality has its special advantages and its peculiar problems, and only the most general problems are shared by all irrigated regions. It is the purpose here to call attention to some of the general problems and to point out some of the ways in which they are being solved.

For instance, the questions of the best method of clearing and leveling land for irrigation, of building distributing ditches, and of the first crops to plant are local problems to be determined for each new region. There are many different methods of leveling land and getting water over it. Almost every region has its peculiar system, and the newcomer who would save his money and avoid serious mistakes will follow the system generally in use until he has established himself and learned the local conditions.

SELECTING AND STARTING AN IRRIGATED FARM.

The selection of an irrigated farm is not a matter that may be safely delegated; nor is it a matter that should be undertaken carelessly or hurriedly. One who proposes to spend his life on a piece of land and to leave it as a heritage to his children should take plenty of time and, if necessary, spend a little money on a preliminary investigation. There are many important factors to be kept in mind. The available lands in any new region often differ greatly in immediate, if not in ultimate, value. It costs much more to prepare some lands for irrigation, and some will yield returns much more quickly than others. These and many other factors should be kept in mind when the farm is selected. Above all things, it is unprofitable to buy a farm through correspondence without seeing it and then to employ some one else to put it into crops. This custom of buying a home ready made and on the installment plan has little to recommend it, so far as the buyer is concerned.

The development of a farm under irrigation is almost always a slower and more expensive undertaking than where irrigation is not required. The land must be leveled and ditches constructed in addition to all the work required in establishing a new farm in unirrigated regions. The cost of such work varies greatly in different localities. Where it is too expensive to be done all at once, the producing area of the farm is, of course, limited accordingly. Then, too, desert land is not always immediately productive when water is first applied. It sometimes takes a season or two, or even longer, to get into condition for the profitable growing of crops land that will

eventually become productive. In regions that are isolated and at long distances from the larger markets, so that only the higher priced fruit and dairy products will bear the cost of shipment, it is sometimes several years before new farms begin to bring in any considerable cash returns. It is therefore a wise precaution to retain enough capital to carry one through at least the first season as an insurance against total crop failure.

Probably no other single factor has caused more failures on irrigated farms than enforced abandonment through the lack of means or perseverance to stay on the farm through the first years until returns begin to come in. There are relatively few locations where the soil is immediately productive and where there is a market for such produce as can be grown the first year or so.

CHOOSING CROPS AND CROP ROTATIONS.

In the development of a new agricultural region it is seldom possible to predict what crops will prove the most profitable. In almost any region the farmer is forced to choose from a large number of possible crops the ones best suited to his needs and markets. In any new region there is a tendency to specialize on one or at most a very few crops, and in the irrigated regions, particularly, this tendency toward a single crop is very pronounced. The use of crop rotations and the intelligent diversification of crops on the farm are never conspicuous features of a newly opened agricultural region. Grain and alfalfa are the pioneer irrigated crops, and these are usually followed by attempts to grow vegetables or orchard fruits extensively. Sometimes, indeed, new land is put into vegetables, orchard fruits, or sugar beets in an attempt to secure early cash returns. There are altogether too few irrigated regions in this country at the present time where any attempt is made toward the use of crop rotations with a view to keeping up the productive capacity of the soil. There appears to be a widespread impression that the fertility of irrigated lands is inexhaustible; that land may be used for a single crop or for a series of intertilled crops for an indefinite period. The experience of generations of farmers in humid regions is disregarded. New land is often planted to orchard fruits, to be continuously intertilled from the first and with the expectation of continuing this clean culture and fruit production indefinitely. In fact, whole regions are sometimes opened to colonists, with the expectation that each farm will immediately become and will remain exclusively devoted to some type of orchard fruits, with its consequent clean cultivation and without any means of maintaining the absolutely essential supply of organic matter.

One of the most serious problems on American irrigated lands is that of organic-matter supply. As long as these lands remain relatively cheap and the farm units are not too small, a rotation of crops, including alfalfa, can be used. But alfalfa is far from being an ideal rotation crop for many regions, and the temptation is strong, once a good stand is secured, to let it remain as a permanent crop outside the rotation. For orchards and vineyards we lack a suitable assortment of annual leguminous crops to use for green manure. These problems of crop rotation and of the supply of organic matter are usually problems of the older irrigated regions, though in some instances the desert lands are naturally so poorly supplied with organic matter that this question quickly becomes acute.

In some of the older and more highly developed irrigated fruit regions farmers are now confronted with this problem of plant nutrition. This is particularly true in those sections where a scanty water supply requires continuous clean tillage for moisture-conservation purposes. This clean tillage has not only prevented the addition of any new supply of organic matter, but has made conditions in the highest degree favorable for the complete disintegration and conversion of the supply originally contained in the soil. The importance of organic matter can scarcely be overestimated. Its depletion must be avoided if crop production is to be maintained. It therefore becomes a problem of the first importance to so plan the crop rotations on the farm and to so arrange the orchard plantings as to provide for the use at frequent intervals of such crops as will increase the supply of organic matter in the soil.

TILLAGE AND WATER ECONOMY.

The lavish use of water is the direct cause of many serious irrigation difficulties. In fact, some of the most profitable and highly developed irrigation farming in this country owes its existence and prosperity to a scarcity of water supply. As long as a farmer has an abundance of water he almost invariably yields to the temptation to use it freely, even though he gets no increase in returns as a result. Where crop production is dependent on rainfall, and particularly where the rainfall is barely sufficient, farmers soon learn the value of careful and thorough tillage both in preparing the land for a crop and later whenever intertillage is possible. But the irrigation farmer with an adequate water supply is slow to appreciate the fact that thorough tillage methods abundantly repay their cost. In new regions, particularly, the tendency to neglect tillage is pronounced. In new irrigation regions weeds are usually not abundant, and one of the most

obvious reasons for good tillage is lacking. The fact remains, however, that in irrigation farming good tillage pays, whether the water supply is abundant or scanty.

Excessive irrigation leaches the soil or fills it with water to the exclusion of air and consequently interferes with the activities of the micro-organisms upon which crop plants depend for their food supply. Good tillage produces the opposite result. A wet soil remains cold, while a well-tilled soil warms up quickly and favors plant growth. It is not sufficient to keep down the weeds by cultivation. With intertilled crops a cultivation should follow every irrigation, and the land should be irrigated no more frequently than is absolutely necessary. This much is true where there is abundant irrigation water. Where the irrigation water is scanty there is the added advantage that it can be made vastly more effective if supplemented by tillage. As a people we have much to learn in the way of water economy. With proper use the irrigation supply of the great majority of our irrigation districts could be used for much larger areas than it covers at present.

A more judicious use of the supply would also in many cases result in larger yields to the acre and would permit the use of large areas now kept too wet for crop production through the excessive use of water on adjacent land.

UNDERGROUND WATERS AND ALKALI.

One of the most striking features in the history of irrigation in the Old World is the ruin of irrigation enterprises caused by the rise of underground waters and of alkali. Both in theory and in practice these phenomena are closely associated. Arid lands almost universally contain large quantities of soluble salts, because these salts—the products of rock disintegration and soil formation—are not leached out by rain. The more common salts thus formed are sodium chlorid, sodium sulphate, and sodium carbonate, and though only the last is really an alkaline salt, the popular term "alkali" is applied to whatever salts occur in the soil water in sufficient quantities to check or prevent plant growth. Excessive irrigation in time fills the soil with water, in which these salts are dissolved, and the evaporation of the water from the ground brings the salts up and leaves them at or near the surface in constantly increasing quantities. Unless natural drainage courses are present or artificial ones are created the inevitable result of excessive irrigation is that the land becomes too wet or too alkaline for the growth of crop plants.

This problem of underground waters should be constantly in mind, not only in the selection of an irrigated farm but also in its manage-

ment. It does not suffice that a farmer himself use irrigation water judiciously, for the reckless use of water on adjacent higher land may ruin a farm completely. It is true that either underground waters or alkali alone may cause trouble in some cases, but they occur most frequently together and both yield to the same remedy, which is adequate drainage.

There are a few irrigated regions in the western United States where a high underground water table is not a menace to crop production and where subirrigation is practiced, but in these regions there are unusual local conditions. In the great majority of cases where the underground water table is so close to the surface that capillary action can bring water up from the lower depths of the soil to be evaporated at the surface, serious trouble with alkali is almost certain to follow. There are a few localities where alkali is a serious problem where apparently there is no well-defined underground water table. In such cases the soil is generally so heavy as to be nearly, or quite, impervious to any leaching action of water. Where this is the case the farmer is confronted with an extremely difficult problem which involves special treatment of the soil, either by proper tillage methods or by the addition of manure or gypsum, in order to overcome the imperviousness. The one certain remedy for alkali difficulties is drainage. Wherever it is possible to bring about a progressive downward or lateral movement of water through the soil, alkali ceases to be a problem. Where this is not practicable and where alkali occurs in relatively small quantities, a temporary postponement can be obtained by the sparing use of irrigation water to wash the salts down into the soil and by thorough tillage after irrigation, which will tend to prevent the return of the salts to the surface through the capillary movement of the water. In general, however, it seems certain that a downward movement of water through the soil must be maintained either by natural or artificial means before an irrigation enterprise can be regarded as secure from injury by alkali.

In the selection of new land for irrigation farming the possibilities of later troubles from alkali and high ground water should be constantly kept in mind. Where desert land has never been irrigated there is very often no superficial indication of alkali, and to the inexperienced observer it is hard to predict what irrigation will develop. To one well acquainted with the region this is much less difficult. The native vegetation, if properly interpreted, is a very satisfactory indicator of the presence or absence of injurious quantities of salts in the soil. In different regions there are different species or groups of species that are commonly regarded as the most valuable indi-

cators. In the lower Colorado River Valley, for instance, the presence of the creosote bush (*Covillea tridentata*) is regarded as an indicator that the land is fairly free from alkali. In the Great Basin the presence of the greasewood (*Sarcobatus vermiculatus*) indicates that alkali troubles may be expected.

In prospecting a new region it is always desirable to learn the local opinions regarding indicator plants, to observe the depth and character of water in wells or drainage channels, and to note the general topography in relation to any piece of land under consideration. In any section with pronounced topographic features this last is very important. There are valleys in the West where irrigation has been used first on the valley floor, then on a bench just above, and later on still higher benches, with the result that the valley floor and the lower benches have been swamped by the salt-bearing seepage water from above. Damage of this sort can be prevented or remedied by proper drainage measures, but until this can be worked out and put into effect the lower land remains practically worthless.

Much remains to be learned concerning the movement of underground water and its relation to the accumulation and removal of alkali. This problem is of direct and immediate importance, not only to the majority of individual irrigation farmers but to those who are responsible for the engineering features of irrigation enterprises.

COMMUNITY LIFE AND COOPERATION.

Irrigation farming ordinarily involves much more in the way of community relationships and responsibilities than exist elsewhere in country life. Land holdings are usually smaller, bringing the farm homes closer together. Land values are higher, permitting higher taxation, with its consequent better roads and better schools.

Irrigation communities are, as a rule, isolated from each other and often separated by long distances from other settlements. Their existence depends upon the water supply which the settlers share in common. A larger proportion of their problems are community problems than is the case where settlement is more sparse and the settled areas are less sharply defined. The prosperity of the individual depends to an unusual degree upon that of the community. In other words, the members of a community find it in the long run to their advantage to deal with problems from the community standpoint rather than from that of the individual. The general acceptance of this point of view is one of the important features of irrigation farm life in the United States. The essential elements of community life are not always easily learned or consistently practiced. But with the inducements all in favor of cooperation it soon comes to be generally accepted as a part of the environment.

The cooperative features of life in irrigation communities are many and varied. Beginning with ditch construction and maintenance they extend to the purchase of supplies, associations for marketing produce, various manufacturing enterprises, such as butter and beet-sugar factories, and into the social life in the way of various mutual-improvement associations. These activities and responsibilities are among the distinct advantages of irrigation farming, yet their proper development requires much in the way of individual self-sacrifice.

The tendency toward intensive and specialized crop production in irrigated communities renders some practical problems more acute than in regions that are sparsely settled and have a more diversified agriculture. Among these are problems of insect pests and plant diseases. In communities where some one crop is extensively grown there is always danger that some insect pest or plant disease may find conditions that favor a rapid spread, with large resulting injury. Where an irrigation community is isolated there are better opportunities of avoiding the danger of such invasions, particularly in diseases of orchard fruits, by an effective system of inspection of all nursery stock brought in.

Much of the prosperity of western irrigation enterprises is the result of cooperative work in marketing products. This cooperation has not been limited merely to economy of effort and the avoidance of duplication; it has extended to the task of maintaining a high standard of quality by rejecting all inferior produce, thus securing a well-established reputation for the products. The establishment of such a standard is often difficult to bring about in a new community, for it means the rejection of produce when this action will bring real hardship to many individuals and arouse much dissatisfaction and complaint.

MARKETS AND TRANSPORTATION.

With few exceptions our irrigated lands are situated far from any considerable markets, with the result that revenue-producing crops must be sufficiently high priced and concentrated to bear a relatively large transportation charge. In a new irrigation community the problem of producing crops that can be shipped long distances profitably is always a difficult one. Most of the crops that are naturally grown first on a farm, such as the grain and forage crops, are too low priced to bear large transportation charges. The perishable truck crops, such as cantaloupes and tomatoes, involve large risks, because of uncertain market conditions. It remains to depend for revenue on such crops as potatoes and onions, which are less perishable.

As the community grows older, with more of a nonagricultural local population, the local market becomes something of a factor in

the farm revenue, but at first, when nearly everyone is producing what he uses, or at least using what he produces, the local market must be left out of account and the estimates of revenue must be based on what can profitably be shipped to outside markets.

In view of these facts, it is a wise precaution to plan and equip a new irrigation farm in a new region with a view to producing as much as possible of the food required. This involves the keeping of live stock and poultry and the raising of plenty of vegetables in addition to the grain and forage crops. After an irrigation district has been developed, it is safer to specialize in crop production, if this proves desirable. At first the aim should be to produce the supplies needed for home consumption, in order to cut down living expenses until a market is assured from which a revenue can be derived. Markets for perishable fruits and vegetables are slow to develop and are often uncertain, while dairy and poultry products find a ready sale and will bear long transportation charges.

CONCLUSION.

The problems of irrigation farming have been here emphasized not with the purpose of deterring anyone from venturing westward to make a home on irrigated lands, but rather as a warning that irrigation farming, like any other farming, is a complicated enterprise, with small reward for the inept and the shiftless, though offering the prospect of at least a comfortable home and an independent livelihood for the intelligent and the industrious. Irrigation farming is becoming an increasingly important phase of American agriculture. It is being used not only in the development of the arid West but also in the more humid parts of the country where the requirements of intensive farming exceed the available supply of rainfall or demand water at seasons when the rainfall is inadequate. There is every reason for believing that as the benefits of irrigation become more generally understood it will be much more extensively practiced than at present. Much irrigable land and much available irrigation water still remain unused.

As would be naturally expected, the earlier irrigation enterprises included the simpler engineering problems as well as the better irrigable lands. As the limit of irrigation possibilities is approached, the engineering and agricultural problems become increasingly difficult. Also, as the present irrigation enterprises become older it is to be expected that new and more complicated problems will arise. These inferences appear to justify the conclusion that the ultimate success of irrigation farming in this country will depend largely upon the ability of experimenters and investigators to solve and overcome these problems and upon the extent to which the farmers themselves use the precautions or apply the remedies suggested.

The rapid extension of the acreage of irrigated land will call many colonists who are unfamiliar with irrigation methods and difficulties and who are in some cases unprepared to endure the vicissitudes of pioneer life. It would be too much to expect that this rapid colonization should be accomplished without a considerable number of individual failures. The most that can be hoped is that the great majority of the pioneers will succeed and by their success show the way to overcome the earlier problems, and that through this first success they may gather the courage to meet and overcome the later difficulties that will follow as irrigation becomes an older institution.

POCKET GOPHERS AS ENEMIES OF TREES.

By David E. Lantz,
Assistant, Biological Survey.

INTRODUCTION.

Three groups of North American mammals are generally recognized as enemies of the fruit grower and forester. These are pocket gophers, rabbits, and short-tailed field mice. Each of these does enormous damage, often amounting to thousands of dollars upon a single plantation. In some localities they make the profits from orcharding exceedingly uncertain. Of the three, pocket gophers inflict losses fully as great as those caused by either rabbits or field mice; and since they work underground, the injury is concealed, often until it is too late for protective measures.

DISTRIBUTION AND CLASSIFICATION.

Pocket gophers, locally known also as pouched rats, salamanders, tuzas, or merely gophers, inhabit more than half the entire territory of the United States outside of Alaska and the island possessions. They occur throughout the greater part of almost every State west of the Mississippi, and east of that river in the greater part of Illinois, southern Wisconsin, and large areas in Florida, Georgia, and Alabama. Outside the United States they inhabit northwest Canada northward to Winnipeg and most of the Saskatchewan Valley. They are abundant in many parts of Mexico, whence their range extends southward to Costa Rica.

Nine genera of this family of rodents are recognized, but only three of them occur within the United States. These three may be readily distinguished from one another by the grooving of the upper front teeth. In *Geomys*, the group occupying the Mississippi Valley and parts of the southeastern United States, two distinct grooves are present, a fine sharp one along the inner margin of the tooth and a larger one near the middle (Pl. VIII, fig. 1, *a*). In *Cratogeomys*, a group with somewhat limited range on the plains from middle Colorado southward into Mexico, a single median furrow is present (Pl. VIII, fig. 1, *b*). In the largest group, *Thomomys*, inhabiting the western half of the United States and adjacent parts

of Canada from the Great Plains to the Pacific Ocean, the upper incisor is either unfurrowed or has a very fine groove on the margin (Pl. VIII, fig. 1, c).

The number of species of pocket gophers is upward of 100, the greater number of which belong to the two genera *Geomys* and *Thomomys*. All have similar food habits and are exceedingly destructive to plant life.

GENERAL HABITS.

Pocket gophers live almost entirely within the subterranean tunnels which they excavate, and are seldom seen except when bringing fresh soil to the surface. The often-repeated statement that they are strictly nocturnal is untrue. They are most active in morning and early evening, but when the weather is cool and not too dry they work from dawn to sunset and probably continue during much of the night. They sometimes burrow surprising distances within twenty-four hours, as is evidenced by the number of fresh mounds of earth thrown out in that time. In hot, dry weather they do little digging.

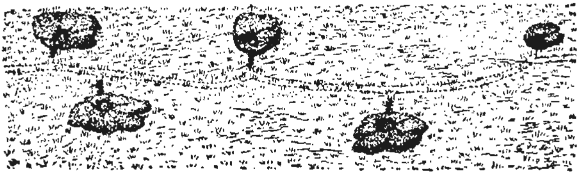

Fig. 1.—Double line of gopher hills. The dotted lines indicate position of main tunnel.

Apparently pocket gophers breed but once a year, usually early in spring, and they produce from two to six young in a litter. T. H. Scheffer, of the Kansas State Agricultural College, trapped thirty-four pregnant females from January 31 to May 13. The smallest number of embryos found was 1; the largest, 6; the average, 4.2. While gophers are less prolific than many other rodents, the seclusion in which they live compensates in great measure for their lack of fecundity, since their enemies have relatively few opportunities to secure them. Except in the mating season and when the female is caring for her young, gophers seem to live alone.

Pocket gophers usually inhabit loose alluvial soils, seldom those that are hard or clayey. Originally they subsisted on roots and stems of native plants, but they immediately turned their attention to the cultivated plants introduced by the settler, including succulent garden vegetables, alfalfa, and clover; they are indebted to the settler also for the destruction of many of their natural enemies and for loosening the soil by tillage. Thus the gopher's environment is

greatly improved, and, except where due vigilance has been exercised, these pests have multiplied and greatly extended their range in cultivated lands.

Pocket gophers do harm in many ways. They eat hay and pasture and cover grass with earth. They cause heavy loss of hay by preventing close mowing. Their burrows admit surface water and on sloping ground lead to the washing of deep gullies. Their tunnels in dams and levees cause many costly breaks. They ruin gardens and injure many field crops. Besides all this, and probably as important, is the damage they do to fruit and other trees.

INJURY TO ORCHARDS.

While the pocket gopher no doubt exercises choice in its diet, it injures nearly all common kinds of fruit trees. It is said that on some parts of the Pacific slope gophers do not injure the peach, but probably this is because better-liked trees are available. It is certain that the gopher of the Mississippi Valley often damages the peach severely.

Dr. A. K. Fisher, of the Biological Survey, informs the writer that in southern California he observed that the roots of the fig tree seem to be most subject to attacks of gophers and that those of the apricot appear to stand next in favor. Orange, lemon, almond, apple, pear, and all other orchard trees of the region, except the peach, are injured by the animals.

In regions inhabited by gophers the selection of an orchard site free from them is often impossible. The soil best suited for trees is most likely to be infested by gophers. Frequently the orchardist, in order to have the soil in proper condition for tree planting, first raises and turns down crops of alfalfa, clover, or cowpeas. Sometimes he grows preliminary crops of sweet potatoes or sugar beets. As any of these crops is likely to attract pocket gophers to the place and increase the danger to trees subsequently planted there, the fruit grower will find it all the more necessary to rid the land of the pests before planting his orchard.

Fruit trees are often badly injured before their owner is aware of the presence of the animals. Harry Cummings, of Heppner, Oreg., writes that one spring, while he was absent from home but a week, gophers destroyed 40 of his choice fruit trees. Although evidences of the presence of gophers are usually unmistakable to the experienced eye, it sometimes takes unusual vigilance to discover them, especially among tall grass, weeds, or other undergrowth. The mounds of soil show plainly the general direction of the main tunnel. Each mound is at the extremity of a short lateral dug upward and outward to the surface nearly at right angles to the main tunnel.

Each load of soil pushed up and over the mound makes it higher and wider. The double line of hillocks may be traced to that last made, which is generally small and composed of fresh, moist soil (fig. 1). The lateral leading to this latest mound is not usually packed solid with soil, but is either left open temporarily or loosely filled. Open laterals are sometimes used as exits through which the gopher comes to secure food or to take observations.

A gopher which in tunneling comes to a tree root attacks and eats through it. If the root is relished, it is followed and eaten close up to the tree trunk. Then another root is destroyed, and so on until the entire root system is gnawed away, wood and bark alike, leaving the trunk loose in the ground. Large trees are sometimes entirely girdled just below the ground, the gopher cutting deep into the wood below the bark. This kills the tree as certainly as if its root system were destroyed. The work resembles that done by pine or meadow mice, but the girdling is deeper and much more quickly fatal to the tree. J. B. DeJarnatt, of Colusa, Cal., during the season of 1898–99, lost fully a hundred fine prune trees, three to fifteen years planted, all girdled below the ground by gophers. Plate IX is from photographs of an apricot tree 5½ inches in diameter killed by gophers at Banning, Cal. The girdling below the ground was complete.

Sometimes the pocket gopher on approaching a large orchard tree goes from root to root at some distance from the trunk, eating parts or girdling them in turn. Occasionally it injures smaller roots only, and does not immediately or even seriously impair the growth of the tree. But there is always danger, should the animal not be destroyed, that it will continue its work until it has killed many trees. Besides the direct damage, its injury to the roots of orchard trees affords opportunity for subsequent attacks of fungous or other diseases.

INJURY TO NURSERY STOCK.

Complaints from western nurserymen of injury to their stock by pocket gophers are frequent. The trees in nursery rows are small and close together. Consequently a gopher by following the rows can in a short time kill many trees. When the animal enters a nursery, a favorite method is to follow for about a rod the first row of trees encountered, then to cross to another row, and thus to cross the entire block of trees, destroying a dozen or more from each row. Such injury is usually done in late fall or winter, and the nurseryman is often unaware until spring of the mischief done by the gopher.

In attacking nursery trees the gopher takes the entire root, not merely the bark. It does not eat the roots all at once, but cuts them into short pieces, packs them into its enormous cheek pouches, and

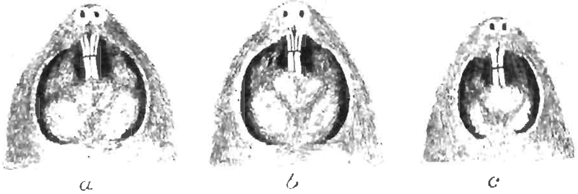

FIG. 1.—FACES OF POCKET GOPHERS, SHOWING POUCHES AND INCISORS.

[illegible]

FIG. 2.—ROOT OF APPLE TREE GNAWED BY POCKET GOPHER. ROOT KNOTS PROMINENT.

Fig. 1. Apricot Tree Killed by Pocket Gopher.

Fig. 2.—A Section of Same Tree. The Injury was Under Ground.

FIG. 1.—ALMOND TREE KILLED BY ROOT KNOT, OR CROWN GALL.

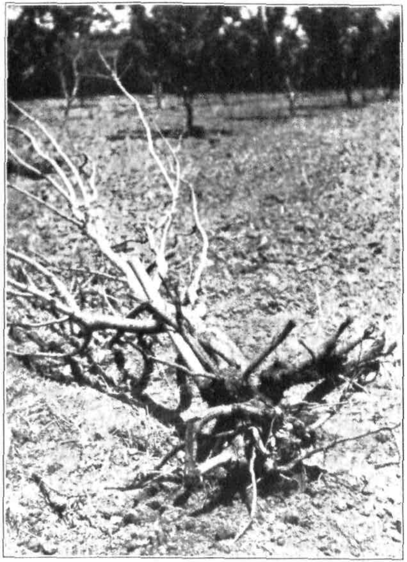

FIG. 2.—SAME TREE WITH ROOTS EXPOSED.

carries them away to its caches, or stores, of food. It is these provisions for the future that make its injury to young orchards, nurseries, and gardens so extensive. The animal lays up far more than it ever consumes. It is not uncommon to plow up stores of small potatoes or roots of clover, alfalfa, or trees amounting to from a peck to a half bushel at a place. As the stores are usually placed much deeper in the ground, those uncovered by the plowman are but a small part of those deposited by the animals.

INJURY TO FOREST TREES.

Pocket gophers seldom inhabit dense forests, but in the open forests of Georgia, Florida, and Alabama they live almost entirely upon tree roots; still the injury they do to the forest growth is not serious. In the Prairie States where gophers occur they sometimes damage young trees growing naturally along the borders of streams, but their harmfulness to forest interests is best illustrated by their work in young artificial plantations. They injure windbreaks, ornamental plantations, and shade trees fully as much as they do orchards, and in the same manner.

Gophers are especially detrimental to young forest plantations in the sandhill regions of the West, and, like rabbits, make the work of forestation very uncertain. They are even worse than rabbits, because they work unseen and almost invariably kill instead of merely injuring the young trees.

POCKET GOPHERS AND CROWN GALL.

Fruit growers in many parts of the country report the increasing prevalence of crown gall, or root knot, in orchards and nurseries. This disease manifests itself in a callous growth of hypertrophied tissue on some part of the root system of the tree. It occurs after a wound made in grafting, planting, or cultivating the tree or by other means. The exact nature of the disease is not well understood, but whether it be a fungus or, as is more likely, due to a bacterium, the wounding of the root seems an essential condition to its entrance. Soft crown gall occurs frequently on roots injured by pocket gophers or mice. Of course the abundance of soft tissue in the root knots would probably lead a rodent to attack the diseased part rather than a smooth, healthy root. Yet the fact that, in some orchards, crown gall is rare except in trees whose roots have been injured by mice seems to indicate that the disease is more commonly the effect rather than the cause of the animal's attack.

N. Hollister, of the Biological Survey, writing from Banning, Cal., May 5, 1909, stated that often in that vicinity almond trees are killed by root knot, or crown gall, and he sent photographs of a

four-year-old tree that had died from this desease. Old gopher tunnels had extended to its roots, and no doubt the roots had once been injured by these animals (Pl. X).

The accompanying illustration of injury to an apple tree by pocket gophers shows the presence of crown gall on all the remaining roots (Pl. VIII, fig. 2). From what is now known of the nature of this disease and the fact that it occurs commonly on trees once injured but not killed by gophers or mice, it is safe to conclude that it is often caused by attacks of these animals.

DESTROYING POCKET GOPHERS.

The orchardist or forester, before setting out trees in a tract infested by pocket gophers, should take the precaution to rid the land of these animals. In addition, adjoining premises, roadways, and waste places should be cleared of the pests. The more thoroughly the work is done, the more permanent will be the benefit. Several means of combating gophers are available.

POISONING.

If but few pocket gophers are to be destroyed, there is little choice between traps and poisons as the means to be used. If, however, the animals are numerous or distributed over large areas, poisoning is by far the quickest as well as the cheapest method.

Strychnia sulphate is recommended as the most satisfactory gopher poison. If properly used, it involves no danger to other animals. The chief requisite for success is to get the poisoned baits into the main tunnel. If left in the lateral where the gopher is working, the baits are frequently pushed out with the soil, to be wasted or possibly to become a source of danger to birds or other animals.

Considerable latitude is possible in the choice of baits for gophers. Pieces of potato, carrot, beet, sweet potato, and celery, also raisins, prunes, shelled corn, wheat, and green alfalfa have all been used with success. The ripe raisin grape has been recommended by California orchardists. The first seven named are prepared by inserting in them dry strychnine, in either crystal or powdered form. The pieces of carrot, beet, or potato should not be larger than a hulled walnut. A slit is made in each with a sharp knife and a little of the poison, about equal in bulk to half a grain of wheat, is placed in the cut. To prepare the grain or alfalfa, a poisoned sirup is generally used. The grain is soaked in the sirup; the alfalfa may be either sprinkled with liquid or dipped into it.

The sirup is prepared as follows: An ounce of strychnia sulphate is dissolved in a quart of boiling water, and a quart of thick sugar sirup is added and the mixture thoroughly stirred. This liquid is

enough to poison 35 pounds of grain or 30 pounds of green alfalfa. For the alfalfa a little more water is needed. The liquid will keep for several months if a little borax is added.

The baits having been prepared, the operator inserts them one by one into the gopher tunnels. The tunnels may be readily located by the use of a prod consisting of a spade handle shod with a metal point and having a metal bar for the operator's foot about 15 inches from the point. The prod when withdrawn leaves a hole through which the bait may be dropped into the gopher runs. The hole may be covered or left open; no difference in results has been noticed by the writer. The prod saves the labor of digging down to the tunnel and enables a man in a day to distribute gopher poison to 30 or 40 acres of badly infested alfalfa land or meadow. For loose soils a pointed stick will answer, but for sod or harder soils the iron-pointed prod with foot bar is far better.

The method just described is applicable throughout the Mississippi Valley and wherever pocket gophers work near the surface. It has been used with great success in parts of Mexico and at certain seasons on the Pacific slope. Experience has proved, however, that in parts of the far West, especially in California, where the soil becomes dry and hard from drought, gophers burrow too deeply for the prod to reach the tunnels. Also, in the very loose dry soil of embankments the sand fills the hole completely when the prod is withdrawn. In such circumstances a spade or shovel is needed to expose the tunnel, and poisoning these rodents becomes fully as laborious as trapping them.

TRAPPING.

Next to poisoning pocket gophers, trapping has given most satisfactory results. While the ordinary steel trap (No. 0) may be successfully employed, the modern gopher traps possess decided advantages. They kill the animals at once instead of holding them for hours by the leg. Most of them are designed to be placed in the lateral where the gopher is bringing up soil, and these are set with much less labor than those for which the main tunnel must be opened. Several excellent special gopher traps have been tested by the Biological Survey, and doubtless there are others equally effective.

To set the ordinary steel trap, an opening should be made in the main runway of the gopher, and the trap so placed that the top is about level with the bottom of the tunnel. The hole should then be covered with sods or boards so as to exclude the light. In trapping gophers bait is rarely used, but probably green food when scarce would make an attractive bait.

The special gopher traps are usually set in the laterals. The freshest mound of earth should be selected. The trapper should then dig

back with a trowel to the open part of the lateral, set the trap there, and either cover the hole or leave it with only a little light entering. A few days' experience will teach one more about setting traps for gophers than pages of directions could. He must not be discouraged by failure at first, but vary the method of setting the trap until he learns the best way for his locality. While the method is somewhat slow, persistent trapping steadily decreases the pests until the last gopher on a farm may be captured. A correspondent of the Biological Survey writes that he caught 1,332 of the animals within 2 miles of his home. A friend of the writer in Kansas trapped 350 gophers on a 40-acre clover field in four months. A California newspaper stated that in the spring of 1901 a man near Watsonville, by using 52 traps, caught 233 in twenty-four and one-half hours. William Burniece, of Bowbells, N. Dak., trapped more than 1,500 gophers on his quarter section during a single year.

FLOODING.

Where available, water is one of the best means of combating pocket gophers. Flooding the land in winter is especially effective, as it wets the animals and drives them to the surface, where they soon succumb to the cold. In warm weather the method can be made effective if men and dogs are on hand to kill the animals as they seek refuge on the embankments. An instance of flooding was reported to the Pacific Rural Press in 1883 by which over 3,000 gophers were killed from 20 acres of alfalfa. S. E. Piper, of the Biological Survey, reports that about the middle of April, 1909, at Modesto, Cal., he saw some boys killing pocket gophers that had been driven from an alfalfa patch by flooding. A hundred gophers, more than half of them young of the year, were killed from a 3-acre tract. Outside of irrigated districts sufficient water is seldom at hand to make this method feasible.

FUMIGATION.

Much has been claimed for the liquid known as carbon bisulphid as a means of destroying pocket gophers, and many machines have been invented to facilitate the application of the fumes of burning sulphur to the burrows of these animals; but the experience of the writer and many others has shown that, as a rule, many of the animals escape in both methods of fumigation. They dig so rapidly that in a moment they can close the tunnel to the advancing sulphurous gas, while the gases from carbon bisulphid are often taken up by the porous soil long before they reach the gopher through the intricate burrows. Carbon bisulphid is effective against all animals that have simple burrows, but it often fails with the pocket gopher and the common mole.

OTHER HELPS IN COMBATING GOPHERS.

The assistance given the farmer by the natural enemies of destructive rodents is not to be overlooked or despised. Although the habits of the gopher afford it great protection from predaceous enemies, a considerable number of animals habitually feed upon it. Probably all the larger hawks and nearly all the owls often succeed in capturing pocket gophers outside the burrows.

Of all the birds of prey the barn owl is probably the most useful to the farmer. Nearly all stomachs and pellets of this bird received from California by the Biological Survey contained remains of the pocket gopher. Clark P. Streator, writing from the same State, says:

> In examining a large series of nests [of barn owl] at all months of the year I have found nothing but gophers [*Thomomys*], except on one occasion where there were one or two specimens of Brewer's blackbird. On further investigation I found a deposit of pellets of nothing but gopher hair and bones which had been ejected by the owls and had accumulated, in a few instances to the extent of 2 or 3 cubic feet, in the trees in which they had lived. I also found that in the breeding season it was not uncommon to find six or more gophers, that were not eaten by the young, lying about the nest.

W. M. Bristoe, in the Pacific Rural Press for October 23, 1897, states that a neighbor found barn owls had made their home in the pigeon-house. Thinking they were after the pigeons, he shot the male and the next day trapped the female in the house. On investigation he found four young owls in the nest, together with the bodies of ten pocket gophers. He immediately released the female. Prof. A. J. Cook, in writing of this bird says: "This owl in southern California might well be called the gopher owl, as that pest of our gardens, orchards, and alfalfa fields, the gopher, forms a large part of the daily rations of this owl."

The great blue heron (*Ardea herodias*) is especially valuable in destroying pocket gophers. Many ranchmen in California protect this bird on their lands. Its excellent work in killing field mice and gophers entitles it to careful protection everywhere.

Of the carnivorous mammals, badgers, weasels, wildcats, coyotes, and skunks kill many of the pests. The badger is especially efficient in capturing them, a fact which should be widely known, as this valuable mammal is often wantonly destroyed.

Two natural enemies of the gopher are particularly important, because they are able to traverse its burrows. These are weasels and snakes. L. C. Cummins, of Riverside, Cal., writing to the Biological Survey, February, 12, 1892, says:

> At one nursery at Riverside we were bothered with gophers; all at once the gopher became scarce and from one to five weasels could be seen nearly every day running through the nursery stock and over an adjoining hill. They completely drove away and killed all the gophers.

Of serpents, the bull snakes (genus *Pituophis*) are of first importance. The Pacific bull snake (*P. catenifer*), because of its habit of killing pocket gophers, is quite generally called the gopher snake. A writer in the Pacific Rural Press for May 12, 1888, says of the reptile:

It is an act of insane folly to destroy them, for they are the most active and efficient allies of the nurseryman, farmer, and fruit raiser in the destruction of those most pernicious pests, the gopher and the squirrel. They destroy more gophers than all the appliances that man can bring to bear in the shape of traps, poisons, and gases.

Dogs are excellent assistants in killing pocket gophers that have been driven from fields by flooding. They are indeed almost indispensable when men or boys are not available, and they may be trained to a high degree of efficiency. Occasionally a cat which roams afield abandons its ordinary diet of mice and birds and devotes its energies to catching gophers. The writer has heard of several cats whose owners regarded their services as gopher destroyers as invaluable.

COOPERATION.

In warfare against any rodent pest little permanent good can be accomplished except by cooperative effort. Although it always pays the individual farmer or fruit grower to exterminate pocket gophers from his own lands, yet if he can not secure cooperation of the whole community he must constantly guard against a return of the pests and be ever ready to renew offensive operations against them. With united effort the animals can be completely exterminated over entire townships, or even counties, and when this is accomplished immunity from the pest will continue indefinitely.

THE FUNCTIONS AND VALUE OF SOIL BACTERIA.

By Karl F. Kellerman,

Physiologist in Charge of Soil-Bacteriology and Water-Purification Investigations, Bureau of Plant Industry.

INTRODUCTION.

After reaching maturity and dying, plants decay and become again an indistinguishable portion of the soil in which they grew. Only recently the science of bacteriology has shown how remarkable is this transmutation of the dead plants back to soil; in fact, bacteriology, and more especially soil bacteriology, has changed our conception of a soil. It is no longer thought of as merely an inert mixture of substances forming the earth's crust, but rather as a mixture of substances supporting various definite groups of soil bacteria, and usually supporting other forms of plant life.

Bacteria themselves are plants. They form the simplest group of the fungi, or plants that are lacking in chlorophyll. They are exceedingly minute; the largest forms may reach a diameter of 0.008 mm. (0.0003152 inch), though the majority are not more than 0.005 mm. (0.0000197 inch) in diameter, and it is believed that some bacteria exist which are too small to be seen even with the aid of the most powerful microscope. In spite of their small size, however, they are concerned with every phase of our daily life and by their incredible numbers and ceaseless activity overcome their apparent insignificance. Bacteria cause diseases, make milk sour, spoil jars of preserved fruit, form ptomaine poisons in meat, and in many ways are a most troublesome scourge. In spite of all the evil that some species of this group of plants cause, however, other species, and even some of the troublesome species under different conditions, are so beneficial that, biologically speaking, bacteria must be considered the most important factor in the great drama of life upon the earth.

THE RÔLE OF DIFFERENT GROUPS OF BACTERIA IN THE SOIL.

The bacteria of the soil are chiefly of the beneficial types. They occur in almost infinite numbers, a fertile soil having from one-half a million to ten million to the gram (from 15,000,000 to 300,000,000 to the ounce). Their functions and value are variable, both because the kinds of bacteria differ in soils and because any given species may vary physiologically within certain limits according to en-

vironmental conditions. The moisture, the temperature, the degree of pulverization, the rock formation or the geological history of the soil, the aeration, the drainage, etc., are all factors which partly determine the action of soil bacteria; and perhaps more important than any of these limiting conditions is the effect of one kind of organism upon those with which it is closely associated, or, more broadly speaking, the effect of the associative or competitive action of the various groups of micro-organisms which act and react upon each other.

If the conditions are favorable, it is the province of some of these groups of micro-organisms to decompose dead plant and animal matter into simpler compounds, to reconstruct various inert materials, and in this way to form new soil constantly and maintain it in a state of high fertility. If, on the other hand, conditions of food supply and environment are unfavorable, certain groups of bacteria may destroy the potential fertility of a soil in ways that will be explained later. It should be remembered that soil fertility has a relative rather than a definite meaning, for a soil may be fertile with respect to one crop and unfertile with respect to another; cowpeas might grow luxuriantly where cotton would barely exist, and oats do well where corn was a failure.

THE ACTION OF NITRIFYING AND DENITRIFYING BACTERIA.

It is known that different species of bacteria are responsible for certain changes in sulphur compounds, phosphorus compounds, carbon compounds, etc., yet those groups which transform the nitrogen compounds have been more thoroughly investigated. They illustrate very satisfactorily how intimate is the connection between successful agricultural practice and the maintaining of a proper environment for the desirable bacteria, as well as indicating some of the conditions under which bacterial activity may be a serious menace to the productivity of a soil. It is generally recognized that a field capable of producing a good yield of any of the usual crops, such as corn, wheat, potatoes, or cotton, must contain a supply of nitrogen which can be dissolved in the soil water. To be in its most available form, that is, in a form best adapted for the crop to assimilate, this nitrogen must be oxidized to nitrate.

Assuming that sufficient nitrates and other foods for a corn crop were present to allow the corn plants to mature and thus form starch, oil, plant proteids, etc., the changes of the nitrogen compounds that are due to soil bacteria might proceed as follows: The stalks may be left on the field and thus add a small quantity of nitrogen in the form of proteid or plant albumin, a substance that other corn plants could not assimilate as such. The ears of the corn may be fed and some of the nitrogen of the seed may go to building up beef or horse

flesh; if the animal dies and the carcass be pulverized and spread over the field the nitrogen of this fertilizer would be in the form of an animal proteid, such as constitutes a large part of blood or muscle. Here, again, the nitrogen would not be in a condition available to a corn crop. Of course, all the nitrogen of the corn which was fed was not used in building up the animal's flesh and blood, but even the nitrogen excreted by the body processes and returned to the field as fresh manure is not in available form.

These complex nitrogen compounds which have been carried back and spread over the field or were left there (the cornstalks, the dead animal fertilizer, and the fresh or unrotted manure) are made useful by the ammonifiers which grow and multiply in them and are one of the largest groups of bacteria which cause decay. As the name of this group indicates, the function of these bacteria is to split up the complex nitrogenous compounds and to form ammonia. A second group of bacteria changes the ammonia into nitrite, a substance which if present in large quantities is poisonous to most plants. As soon as nitrite begins to accumulate, however, a third group of bacteria oxidizes it to nitrate; this combination of nitrogen is most suitable for plant food, being for plants practically what meat is for man. Some plants, notably the cereals, are said to be able to assimilate nitrogen in the form of ammonia. Greenhouse experiments, however, indicate that even if this be true better results are obtained after the ammonia is in turn acted upon by nitrifying bacteria and changed to nitrate.

The nitrogen changes, however, are not confined to the series just reviewed. There are contrary groups of bacteria which, under slightly different conditions, are capable of doing the exact opposite of the three groups just mentioned. With organic food and nitrate accumulated in abundance one group reduces the nitrate to nitrite, a second reduces the nitrite to ammonia, and a third group may reduce the ammonia to free nitrogen gas. This loss of gaseous nitrogen, or denitrification, is very injurious, for, as may readily be seen, it actually decreases the potential productiveness of the soil. There are other changes, however, which for want of better terms are also classed with denitrification. Many kinds of bacteria, especially those which act upon nitrate compounds in forming the proteid compounds of their own cells, as they increase in number may utilize much of the nitrogen of the substances upon which they feed. It is evident, therefore, that a change of nitrate into organic or proteid nitrogen may take place without the aid of either higher plants or animals, and in this more or less insoluble form nitrogen that otherwise might be carried away by rains and drainage water is preserved to become available to growing crops at some future time.

The reciprocating or complementary action of the various groups of bacteria which transform nitrogen compounds is more easily ex-

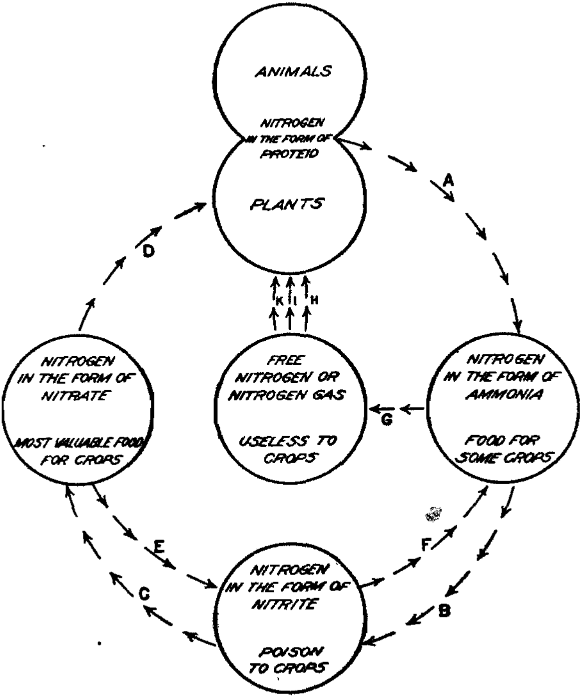

FIG. 2.—Diagram showing the nitrogen changes produced in the soil by the action of bacteria. The arrows indicate the course of the changes which various groups of bacteria may produce in the nitrogen compounds of the soil. *A*, Action of ammonifying bacteria which change organic nitrogen to ammonia; *B*, action of nitrifying bacteria which change ammonia to nitrite; *C*, action of nitrifying bacteria which change nitrite to nitrate; *D*, assimilation of nitrate by green plants; *E*, action of denitrifying bacteria which change nitrate to nitrite; *F*, action of denitrifying bacteria which change nitrite to ammonia; *G*, action of denitrifying bacteria which change ammonia to nitrogen gas; *H*, action of bacteria which change nitrogen gas into proteid nitrogen; *I*, action of bacteria which in symbiosis with leguminous plants change nitrogen gas into proteid nitrogen; *K*, action of bacteria which in symbiosis with certain nonleguminous plants change nitrogen gas into proteid nitrogen.

pressed by a diagram. In figure 2 the ammonifying bacteria, as indicated by the line *A*, are represented as changing the organic

nitrogen, formed by the growth of plants and animals, into ammonia. This transformation often takes place so rapidly that much of the ammonia is given off as a gas, a fact that anyone who has been near a manure heap during the warm spring days will remember. The ammonia that is retained in the soil now becomes part of the food of the nitrite bacteria, indicated in the diagram by the line *B*. If the supply of air in the soil is sufficient to furnish the nitrite bacteria with an adequate supply of oxygen, which is an essential in all these processes of nitrification, they will gradually oxidize the ammonia to nitrite. A large number of species of bacteria are able when in the soil to bring about this change, but many of them lose this power shortly after they are isolated and grown as pure cultures in a laboratory. As previously stated, an accumulation of nitrite would be injurious to crops, but in the processes of nature the phenomena are so adjusted that the selfish struggle of each individual for food conduces to the welfare of all. If the soil is in good condition, long before sufficient nitrite is formed to injure the crop the nitrate bacteria, indicated by the line *C*, are at their feast transforming nitrite into nitrate, or, in other words, preparing the nitrogenous food for the crop. The assimilation of nitrate by crops is indicated by the line *D*. If now to this soil which is rich in nitrate there is added a large quantity of organic matter, for instance, by applying dried blood or by turning under a heavy green manure or by a heavy top-dressing of manure, and especially if the soil becomes too compact or becomes water-logged, so as to exclude air, undesirable bacteria which feed partly on nitrate and nitrite and partly on organic matter will develop rapidly. These bacteria reduce the nitrate to nitrite and the nitrite to ammonia, as indicated by the lines *E* and *F*. Complete denitrification, or the breaking up of ammonia and the giving off of free nitrogen as that gas which forms four-fifths of the air, will take place as indicated by the line *G*, the quantity given off depending to a considerable degree upon the paucity of the air supply and the abundance of nitrate and the abundance and kind of organic matter. It is interesting to note that there is a wide difference in the range as well as in the rapidity of the reducing power of different species of the denitrifying group. For instance, some species of bacteria can only change nitrate to nitrite, while others can not act upon nitrate at all but can change nitrite to ammonia; on the other hand, certain species can change nitrate to nitrite, nitrite to ammonia, and ammonia into free nitrogen gas.

The following records of recent experiments upon the action of the various groups of bacteria in garden soil when supersaturated with solutions of nitrates and organic matter illustrate the relative speed and the sequence of these processes. The relative quantities of nitrate, nitrite, and ammonia during the course of the investigation

are shown as curves in figure 3. The soil was supersaturated with an infusion of alfalfa plants made by heating 10 grams of young alfalfa plants in 100 grams of water to which was added 0.2 per cent of nitrate. With the dilution due to moisture normally in the soil, together with a slight absorption by the soil particles, the nitrate in solution was reduced to 0.17 per cent at the beginning of the experiment; at this time neither ammonia nor nitrite was present. Two days later the denitrifying bacteria had reduced the nitrate to 0.01 per cent and had formed considerable quantities of nitrite and some ammonia. By the fifth day these bacteria had left only a trace of nitrate, had reduced the nitrite to 0.01 per cent, and had increased the ammonia. For the next five days no change was apparent, though

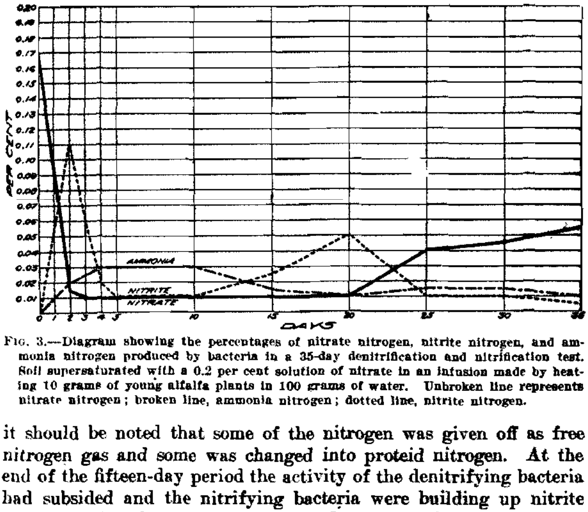

FIG. 3.—Diagram showing the percentages of nitrate nitrogen, nitrite nitrogen, and ammonia nitrogen produced by bacteria in a 35-day denitrification and nitrification test. Soil supersaturated with a 0.2 per cent solution of nitrate in an infusion made by heating 10 grams of young alfalfa plants in 100 grams of water. Unbroken line represents nitrate nitrogen; broken line, ammonia nitrogen; dotted line, nitrite nitrogen.

it should be noted that some of the nitrogen was given off as free nitrogen gas and some was changed into proteid nitrogen. At the end of the fifteen-day period the activity of the denitrifying bacteria had subsided and the nitrifying bacteria were building up nitrite and decreasing the ammonia, and five days later this action had progressed until the nitrite had reached 0.05 per cent, while the ammonia had fallen to 0.01 per cent. At the twenty-five-day period the nitrate-forming group of the nitrifying bacteria had produced an appreciable quantity of nitrate and had left only traces of nitrite. From this time until the close of the experiment at the thirty-five-day period the ammonia and nitrite were kept very small in quantity, and the nitrate was slowly but steadily produced. The groups of nitrifying bacteria were evidently well adjusted during these twenty-

five days, for almost as fast as the ammonifiers produced ammonia the formers of nitrite changed the ammonia to nitrite, and similarly as the nitrite was produced the formers of nitrate changed it to nitrate. During the course of this experiment some of the nitrogen was given off as a gas.

THE FIXATION OF ATMOSPHERIC NITROGEN BY BACTERIA.

Aside from certain symbiotic relationships with bacteria, crops can not assimilate nitrogen gas. It might seem, therefore, as if all of the nitrogen of the earth might eventually be transformed into the gaseous state, thus starving out all crops.

Recurring to the discussion of figure 2, it is evident that with proper farm management no such danger is imminent, for the free nitrogen of the atmosphere can be fixed or combined with other substances to form organic compounds. There are three groups of processes, indicated by the lines *H*, *I*, and *K*, by which the soil bacteria perform this function, which is perhaps one of the most remarkable, if not the most valuable, of all the reactions of the soil flora.

(*H*) The direct fixation of nitrogen by bacteria alone is the first process. There are several species of bacteria that are known to have this power. Among them may be mentioned *Clostridium pasteurianum*, *Bacillus alcaligenes*, *Bacillus tumescens*, *Pseudomonas radicicola*, Granulobacter, and several species of Azotobacter. The latter genus of bacteria occurs in practically all soils, and by its relative abundance seems to indicate what may be termed the natural nitrogen-recuperative power of a soil. Thus in the Coastal Plain soils which are rather readily exhausted of their nitrogen the bacteria of the genus Azotobacter occur only in the few top inches, perhaps from the first to the tenth. In the deep and almost exhaustless soils of some parts of the West, on the other hand, these bacteria are found in active condition even down in the fifth foot.

(*I*) The second process is the fixation of nitrogen by the root-nodule organisms in association with the various legumes. This has been described in former publications and is probably the manner in which the major part of the nitrogen of the air is transformed into plant food. The great economic importance of these desirable bacteria may be seen from the fact that for many years investigators have worked at the problem of disseminating them in soils where they do not naturally occur. Pure cultures for inoculating soils to grow alfalfa, clovers, vetches, and other legumes are now distributed by several American and foreign experiment stations, including the United States Department of Agriculture.

(*K*) The fixation of nitrogen by bacteria in symbiosis with plants other than legumes is the third process. It is impossible to determine at the present time whether this is a scientific curiosity or a fact

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of practical value. Bacterial nodules occur upon at least one species of Alnus (alder), upon *Ceanothus americanus* L. (red root, New Jersey tea), *Ceanothus velutinus* (New Jersey tea), *Eleagnus argentea* Pursh. (silver berry), *Lepargyraea argentea* (Nutt.) Greene (buffalo berry or rabbit berry), *Podocarpus macrophylla* Don, and several genera of the cycads, though it must be admitted that the nodules of the latter group of plants are quite different in some ways from the nodules of legumes.

CONCLUSIONS.

In this brief review of the course of a few of the essential changes which are brought about in soils by definite groups of bacteria it is impossible to discuss the intimate relationship, as yet but partly understood, between the constitution or action of the microscopic flora of the soil and the methods of cultivation, crop rotation, fertilization, etc. Years of research will be necessary before the details are known of the interaction upon each other and upon the soil of the various kinds of bacteria, though from analogy we have good reason for believing that they are grouped and that each type has its particular functions, each seeking and devouring its own kind of food and endlessly forming food for other organisms. Their struggle for existence is undoubtedly similar to that of other and larger organisms, and without their endless struggle and activity plant and animal life would rapidly pass from the earth.

By proper methods of tillage, crop rotation, or green manuring, and even by the application of fertilizers, the interaction between prevailing soil conditions and biological phenomena may be modified so as to promote the activity of desirable micro-organisms and retard the development of the undesirable ones. And as we recognize that bacterial growth is an important factor in the transformation of various materials into available plant food, we appreciate the importance of further investigation for securing more exact and more complete data bearing upon the interdependence of agricultural products and the micro-organisms of the soil. With the application of bacteriology to farm practice, as with the application of the data secured by the plant breeder, the chemist, or the meteorologist, it is for the farmer himself to say whether the net results of farm labor shall be on the side of profit or of loss. The methods he employs in his work are indications of his grasp of the scope and importance of these various investigations, for progress in farming, as in anything else, is in reality progress in methods brought about, perhaps slowly, perhaps suddenly, by a more and more rational comprehension of why we do the things we do.

TUBERCULOSIS OF HOGS AND HOW TO CONTROL IT.

By John R. Mohler, *Chief, Pathological Division*, and Henry J. Washburn, *Senior Bacteriologist, Pathological Division, Bureau of Animal Industry.*

The swine industry of the United States has recently received great encouragement and stimulation from the continued high prices which hogs have been able to command. A Chicago trade paper publishes the average price of hogs at the stock yards for the past year (1909) as $7.40 per hundredweight, while that of the previous year was $5.70. Again, the Bureau of Statistics of this Department gives the average farm valuation of the hogs of the country for the decade 1900–1909 as $6.46, which is $1.28 higher than the price during any decade in recent times. It must be understood that this valuation is one that was placed upon the animals by their owners without any reference to the conditions that might be disclosed a little later in the packing house, for there is little doubt that inspection at the time of slaughter must have shown that the presence of tuberculous growths in the bodies of many of these hogs had greatly reduced their actual worth.

Federal inspections at the abattoirs of the country show that approximately 2 per cent of the hogs slaughtered in them are affected with tuberculosis, and of those affected not far from 10 per cent were so badly diseased that they no longer possessed any value save their worth for grease and fertilizer. It is quite possible that many of the farmers who have sold tuberculous hogs in the past have done so without suspecting that they were unsound, for few of these diseased hogs ever manifest the presence of tuberculosis by outward symptoms at the time they leave the farm. In fact, the hogs that disclose the affection after slaughter are frequently the finest appearing animals in the drove when they are brought to the abattoir. Should indications of tuberculosis be present they will usually consist of those marks of general unthriftiness that are also present in many other diseases, and therefore do not afford any very definite indication of the presence of tuberculosis.

In the majority of cases no intimation of the presence of the disease will be given until the animal is slaughtered, and the discovery of a number of tuberculous hogs in a drove of apparently prime, well-finished animals is often the cause of great surprise and disappointment to their owner, yet the lesions may be so extensive as to render

the meat unfit for food purposes. The Bureau of Animal Industry is at present endeavoring to locate the infected farms, or at least the infected localities, so as to ascertain the direct cause of the spread of the disease in these districts. Owing to the number of hands through which hogs go before reaching the abattoirs this is not an easy proposition, but it can be and is being accomplished. Already, through cooperation with the state authorities, a large number of infected farms have been definitely located, the conditions on the farms have been investigated, the source of the disease determined, and methods for its suppression recommended.

A case in point may be mentioned. In Wisconsin the bureau and state officials have been cooperating in this work in the following manner: When hogs have been found to be tuberculous and the farm from which they came has been located, the state veterinarian is notified, who is empowered by law to quarantine the premises of any farm when he suspects the presence of a contagious disease. He then applies the tuberculin test to the cattle on the farm and otherwise looks for the source of infection. This frequently results in finding the cattle tuberculous. Similar work has recently been taken up with Nebraska, Iowa, Minnesota, and several other States, and the results are equally encouraging. This cooperation with the State is of great value, and the results would be of greater magnitude if state legislation could be secured compelling the tagging of all hogs going to slaughter. If this were done all animals found tuberculous could be immediately traced to their point of origin and the source of infection removed.

It is evident that the suppression of hog tuberculosis would save the country millions of dollars annually, and when it is realized that there are vast numbers of tuberculous hogs killed in abattoirs having no inspection of any kind, it can be seen that the danger to human life from this source would at the same time be removed.

MOST FREQUENT METHODS OF INFECTION.

Knowing that thousands of hogs contract tuberculosis every year, the question arises, How do these animals become infected with the germs which cause the development of the disease? We may arrange the most important causes under four headings: (1) Returned products from creameries; (2) raw or hand-separated milk from tuberculous cows; (3) feeding behind tuberculous cattle; (4) feeding upon tuberculous carcasses.

RETURNED PRODUCTS FROM CREAMERIES.

Considering these causes somewhat in detail, we will find in regard to the first that while many creameries receive milk that is free from tubercle bacilli and from which the separated milk when divided

among the creamery patrons is also free, there are others, unfortunately, which receive milk every day from one or more cows so affected with tuberculosis that they excrete tubercle bacilli in their milk, and these virulent germs find their way in large numbers into the cans of separated milk which are returned to the farmers from these creameries. In this way a single advanced case of tuberculosis in a dairy herd may serve to contaminate a number of farms that were previously free from disease and to spread tuberculosis among the hogs and calves of the vicinity.

This particular means of spreading tuberculosis could be absolutely prevented if all creameries could be induced to pasteurize or sterilize their separated milk before returning it to the producers.

FEEDING MILK FROM TUBERCULOUS COWS.

The second cause to which we have referred is closely related to the first, but may be more easily controlled. It is a cause which usually affects but a single farm at a time and does not damage any of the neighboring stock, as it simply consists of feeding to the young stock on any farm the raw whole milk or hand-separated milk from one or more tuberculous cows that may chance to be members of the herd upon that particular farm.

The serious results of feeding milk from tuberculous cows will be appreciated when it is learned that 83 per cent of a test lot of hogs that were fed on tuberculous milk for three days only contracted tuberculosis from this brief contact with contaminated material. Other hogs that were fed for thirty days upon milk from tuberculous cows contracted tuberculosis without exception. It will thus be seen that creameries are not alone incriminated, but the skimmed milk from the hand separator, if it comes from a tuberculous herd, is equally dangerous, and the buttermilk produced from the infected separated cream is likewise capable of carrying tubercle bacilli and infecting the animals which consume it.

FEEDING BEHIND TUBERCULOUS CATTLE.

The third cause of tuberculosis in hogs, feeding behind tuberculous cattle, is far more important than is generally conceded. It is a very common practice to allow hogs to accompany cattle about the feed lot, and while doing this they thoroughly work over the feces, thus saving whatever portions of food have passed undigested through the alimentary tract of the bovine. (See Pl. XI.) In herds that are healthy this manner of feeding may be commended because of the economy, but wherever there are tuberculous individuals among the cattle the danger of passing the infection on to the hogs by means of the feces becomes very great. In fact, the discovery was only

recently made that many cattle apparently only slightly affected with tuberculosis, and without showing any outward signs of the disease, nevertheless pass tubercle bacilli through the alimentary tract and evacuate them in large numbers with the feces. It is impossible for a lot of hogs to run with a herd of cows of this description without coming into dangerous contact with infectious material from their feces.

Only recently a probable instance of infection of hogs by cattle feces came under observation. Of 34 hogs marketed by Mr. H., 23 were found diseased, and upon investigation it was ascertained that the owner had a herd of dairy cows the stable manure from which was thrown into the hog yard. The hogs were given no milk, nor were they permitted to mingle with the cattle, but were pastured and fed on corn and what they could gather from the cow manure. In fact, the latter form of exposure was the only plausible explanation of infection, and this was later accepted when the tuberculin test of the herd revealed 19 out of 27 cows diseased, which test was confirmed when the cattle were slaughtered and found to be tuberculous, some in an advanced stage.

FEEDING UPON TUBERCULOUS CARCASSES.

Feeding upon tuberculous carcasses or slaughterhouse offal is a fourth important source for the development of tuberculosis among hogs. It is an all too prevalent custom in some sections for hog raisers to buy up all carcasses of animals that have died from various unknown causes and feed them to their hogs. This is a fertile source of infection with parasites and with whatever infectious disease the animal may have been affected at time of death. Several instances of tuberculous hogs being traced to such an exposure have been found. Probably the most important case occurred in an eastern station, where 31 out of 40 hogs were condemned for tuberculosis. When these animals were traced back to the raiser it was found that he was running a large dairy and that a dairy inspector had by clinical examination condemned one of his cows for tuberculosis. The owner, in order to save something, as he stated, from the carcass, hauled it out to the hog pasture and allowed the hogs to consume it, with the above disastrous results. Hogs that had been raised by him previously had never been condemned, and the bunch in question were running on a large pasture separated from cattle and apparently had no other opportunity to become infected than by the condemned tuberculous dairy cow.

An equally dangerous source of infection is likewise observed in the methods which obtain among some of the small country slaughterhouses. It is not unusual for these houses to get rid of their blood,

intestines, viscera, and other inedible parts by feeding them to hogs, a herd of which is usually kept on the premises. This custom is pregnant with danger and is another fertile source for perpetuating the infectious principle of various diseases, and particularly an ingested disease like tuberculosis. The feeding of offal, etc., to hogs on the premises of abattoirs having government inspection is not permitted by the federal meat inspection regulations, and other state and municipal regulations should be equally stringent on this feature, as has been done in the meat regulations of the city of Philadelphia. We have no records of such hogs being tuberculous, as they are killed by the butcher on the premises on which they are fed. As these houses have no inspection the carcasses pass into trade as healthy.

LESS FREQUENT METHODS OF INFECTION.

The fact has been well established that hogs may contract tuberculosis through eating the sputum of consumptives, and that whenever this occurs the form which the disease assumes is fully as severe as though it had been derived from some bovine source. Proper precautions in selecting care takers for farm animals will prevent infections from this source.

Tuberculosis may be transmitted from hog to hog, especially from a tuberculous brood sow to her pigs, but this manner of infection is quite infrequent compared with the number of cases of bovine origin.

The Bureau of Animal Industry has recently been investigating a case in which a large proportion of the hogs shipped from a certain ranch were found to be tuberculous when examined at the packing house, while at the same time it was learned that practically the whole poultry population of the farm had the disease to a serious degree. It was learned that it had been the custom at this place to throw all of the dead hens over into the hog yard, where they were greedily eaten. A pair of tuberculous hens from this affected farm were shipped to the bureau laboratories and these were fed to a pair of healthy pigs two or three months old. The result was that both pigs became tuberculous, which made it very evident that the hogs upon the ranch mentioned derived their infection from consuming the tuberculous fowls. The frequent association of pigs and fowls makes it desirable to eradicate the disease from among the fowls, should it exist, before attempting to clean up the hog quarters.

But these lesser dangers must not be allowed to draw attention away from the two factors of transcendent importance in the causation of swine tuberculosis, namely, the milk and feces of tuberculous cattle. When once these are controlled, tuberculosis of swine will forthwith be greatly reduced.

TANKAGE NOT A CAUSE OF TUBERCULOSIS.

Tankage, meat meal, and other animal food products as feed for live stock, and particularly for swine, have recently attracted a good deal of attention from the farmers, not only because of the prevailing high price of other feedstuffs, but also because of the recent experiments, indicating that greater growth and more fat can be put on the animals, and at a less cost per pound, than by any other feed.

Tankage has proved a satisfactory substitute for skim milk as an adjunct to corn, experiments showing that hogs can be more quickly and cheaply fattened by such a combination than by corn alone. It is generally agreed among feeders that protein is the most important part of the feeding ration as well as the most difficult to procure and the most expensive. Tankage, or digester tankage, as it is commonly called, is very rich in protein, varying from 10 to 60 per cent, according to the firm manufacturing it. It is made from the trimmings, inedible viscera, and other parts of the carcass, all of which are placed in the tanks and thoroughly cooked under pressure, so that the resulting product comes out sterile. The grease is removed from the surface and the residue is dried out at a high temperature, then ground, screened, and placed in 100-pound bags for shipment. Owing to the dryness of the product there is practically no danger of fermentation taking place.

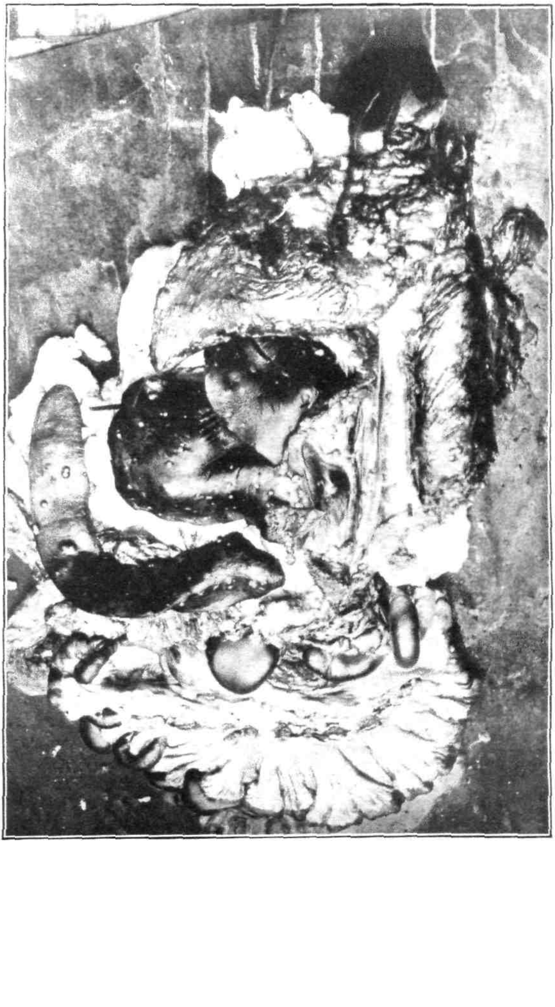
It having been claimed that the increased use of this material for hogs was the cause of the increase in the number of tuberculous hogs condemned at the abattoirs, inquiries were sent out by the writers to state experiment stations where tankage had been fed to hogs experimentally to see if in any case tuberculosis had been developed as a result of such feeding. Experiments were also carried on by the Bureau along the same line. In no case could tuberculosis be shown to have arisen from the consumption of tankage, and it must therefore be absolved from all blame in the spread of this disease, and may be looked upon as a safe and valuable article of food for use in raising and fattening swine.

PATHS OF ENTRANCE OF TUBERCLE BACILLI.

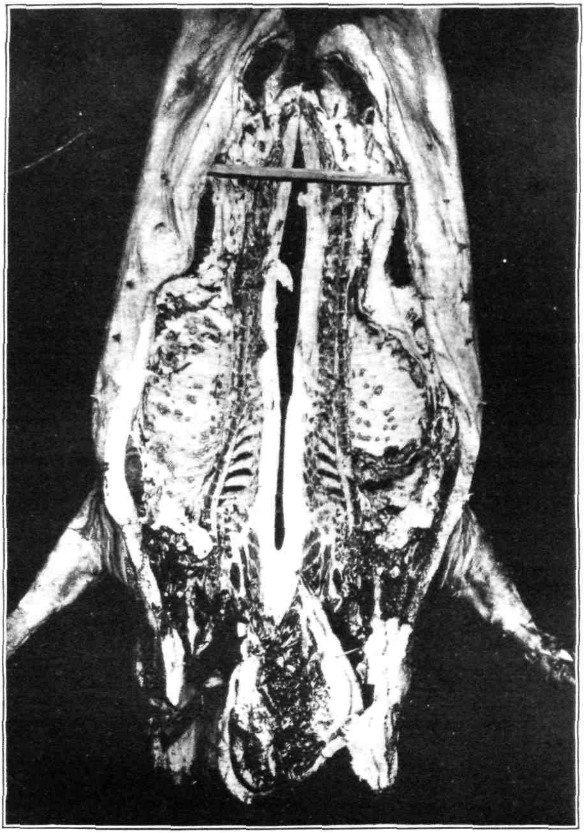
As a result of numerous experiments conducted on hogs, it has been quite conclusively shown that hog tuberculosis is an ingested disease, and that the tubercle bacilli are absorbed almost at the beginning of the alimentary canal, the glands and tissues associated with the digestive tract being the most frequent seats of infection. (See Pl. XII.) The tonsils of pigs have been examined by several investigators, including ourselves, and tubercle bacilli have been found in the apparently normal tonsillar crypts. From the tonsils to the lymph glands of the throat is but a very short distance, and on a

FIG. 1.—TUBERCULOUS HOGS, INFECTED BY FEEDING AFTER TUBERCULOUS CATTLE.

FIG. 2.—TUBERCULOUS HOGS, INFECTED BY WORKING OVER A PILE OF MANURE FROM TUBERCULOUS CATTLE.



TUBERCULOSIS OF HOG, INVOLVING THE LUNGS, LIVER, SPLEEN, AND INTESTINES.



TUBERCULOUS HOG CARCASS, SHOWING ENLARGED GLANDS OF THE THROAT AND TUBERCLES ON THE RIBS.

direct line with the lymph current in the lymphatic vessels. This fact, taken into consideration with the infection of the throat glands in over 93 per cent of all tuberculous hogs examined, shows that the tonsils play a very important part as the portals of entry of the tubercle bacillus. (See Pl. XIII.) Again, hogs may be called scavengers, as they eat various substances, rough or smooth, hard or soft, sharp or blunt; and wood, nails, wire, etc., may be taken into the mouth with the food in such a way as to cause sufficient abrasion of the mucous membrane to permit the entrance of the bacillus, and its absorption by the lymph vessels and subsequent deposit in the submaxillary gland follow. Young pigs at the time of teething are particularly likely to become infected owing to the abrasions of the mucous membrane resulting from the new teeth. Catarrhal conditions of the buccal mucous membrane, such as are observed in stomatitis, also lower the vitality of the cells, allowing the entrance of tubercle bacilli. In a few cases the only lesions observed were in the lymph glands of the intestines, which would indicate that the ingested bacilli had safely passed the usual portal of entrance and had been taken up by the lymph glands. Thus Ryder, in charge of the Boston station, has made a careful post-mortem examination of 59,460 hogs, of which number 50 carcasses showed lesions of these glands only. Of far more frequent occurrence are the lesions of the lymph glands of the stomach and liver and of the bronchial glands. In fact, our study of the lesions of hog tuberculosis shows that next in order of frequency to the throat-gland infection come the bronchial glands, of which 27 per cent were diseased, while the glands of the stomach and liver were involved in 21 per cent of the cases. In all these cases the lesions may involve the entire lymph gland or only the central or several irregular points, and may be either cheesy, limy, or both. The intestinal lymph glands showed lesions in 18 per cent of the carcasses examined, while the liver was affected in 9 per cent of the cases. In a certain small number of cases infection probably occurs directly through the respiratory tract, but these instances are extremely rare, as only 7 per cent of the carcasses above recorded showed lung lesions, most of which were evidently secondary in origin. Even more infrequent are those cases of tuberculosis which arise as a result of traumatism, especially the infection of castration wounds by the use of infected instruments or otherwise.

The small amount of money required to start in the hog-raising business and the quick returns on the amount invested make this an attractive field for the farmer of limited means. Hogs will make greater gains on less feed than almost any other live stock and at the same time utilize profitably waste food products of every variety if properly prepared. As tuberculosis is chiefly acquired by ingestion, the significance of the latter feature is obvious.

Hogs from Arkansas, Oklahoma, and Texas are remarkably free from tuberculosis, this being due to the methods of caring for them, or rather the lack of care. They are not restricted to feed lots, where disease is commonly found, but roam over large areas to shift for themselves. No prolonged feeding in narrow limits is practiced, but from birth to maturity they are pastured on alfalfa, oats, corn, cowpeas, sorghum, rape, and peanuts. Hogs raised in the forest regions of Hungary are likewise rarely affected with tuberculosis.

Buyers from packing houses are learning from bitter experience to avoid sections of certain States, and there are at least two firms which will not buy hogs from one State which is known to be badly infected. In fact many of the smaller packers in the Central West buy subject to post-mortem inspection as a measure of self-protection.

Sooner or later all the packers will buy subject to post-mortem examination, as some are now doing. Then the hog raiser who persists in fattening with tuberculous material will be made to feel the cost of his lack of knowledge or his indifference. To-day the buyer makes his purchases with the knowledge that a certain proportion of his animals will be condemned, and as the post-mortem is the only correct and reliable key, the careful breeder must suffer equally with the careless one. This is not equitable. But when the packer buys subject to post-mortem results, the painstaking and intelligent raiser will receive more for his healthy hogs than he does now, and the ignorant or indifferent breeder will get less for his tuberculous animals, which will be more nearly a fair deal for all concerned.

REMEDIAL MEASURES.

It may appear at first glance that the suppression of hog tuberculosis is an absolutely hopeless undertaking, the more so when we realize that no section of our country is free from it. The inspection reports to the Department of Agriculture show that it is encountered, at least to some extent, in all of the packing houses having federal inspection. But there are many encouraging features in the problem which we shall not overlook. Present reports from inspectors show that in several localities there has been a material decrease in the number of tuberculous hogs sent to market. One State in particular has shown most encouraging improvement. The disease has been studied until its manner of spreading and the proper means of eradicating it are much better understood than they were formerly.

In an endeavor to trace out the origin of the infection of tuberculous hogs that were arriving at one of the packing houses of Iowa, Rogers, of the Bureau of Animal Industry, for some time carried on an experiment which consisted in tagging the hogs that were hauled to market at that place in wagons, before they were removed from the farmers'

wagons, and later using these tags as means of identification in case tuberculosis was found to exist in any of them at the time of slaughter. In this manner 3,420 hogs were tagged, and on tracing them up to their final disposition it was learned that less than 6 per cent of the f ms were shipping all of the tuberculous live stock to that market, while more than 94 per cent of the farms were free from the disease. This proportion of noninfected farms should give great encouragement to any efforts that may be made to eradicate the disease from the State. It was further noted that the successive shipments of hogs marketed by certain farmers always contained tuberculous animals, and in at least two instances the entire consignments were condemned for tuberculosis at the time of slaughter.

Since hogs almost invariably contract tuberculosis through eating infectious material, it is evident that the most effective means of preventing and eradicating the disease must consist of feeding only such substances as are known to be pure and free from all tuberculous taint. This means that we must avoid feeding the milk that has been returned from a public creamery after the butter fat has been removed, unless we are assured that it contains no living tubercle bacilli; it also means that hogs must not be permitted to follow a drove of cattle unless the cattle have been proved to be free from tuberculosis. It may be stated here that the danger of tuberculous infection to hogs following a bunch of fattening steers is comparatively very slight, but whenever there are a number of milking cows included in the drove the dangers are greatly increased, and all such cows should be carefully tested with tuberculin so that the infected animals may be removed from the herd. If it should so happen that one of the cows in the dairy has appeared unthrifty for some time, and has at last died, the carcass should not be fed to the hogs with a view to saving as much as possible out of a misfortune. Just consider for a moment that if that cow has died from tuberculosis she has within her body enough tubercle bacilli to infect a large number of hogs, and the loss from these tuberculous hogs would more than offset the amount saved by feeding the carcass of the cow.

In dealing with affected herds of cattle it has been found best in most cases to apply the tuberculin test to the entire herd as a means of selecting the tuberculous animals, but with a drove of hogs in which tuberculosis has appeared there can be no doubt that the best and surest method of procedure will in nearly every case be the slaughter of the entire drove as soon as they can be put in a marketable condition. They should be slaughtered at an abattoir under federal inspection, so that proper disposal may be made of affected carcasses.

This means of removing from the farm all of the centers of infection which exist among its swine is made possible and practicable

by the ease with which a new drove may be built up from fresh foundation stock. With cattle the offspring seldom number more than one to a cow in a year, and the young cow does not produce until 2 years of age. With swine reproduction may be expected when the young sow is 1 year old, and instead of producing but one at a birth from six to ten may reasonably be expected. If properly handled, the first litter of young may be weaned in time to allow the sow to farrow again the same year. This shows how very rapidly a farm may be stocked with healthy swine after the total slaughter of a tuberculous lot. The early age at which the sow may be bred, her capacity for breeding twice a year, and the plural number of her offspring are forceful arguments for the total destruction of every diseased drove of hogs and the breeding up in clean, healthy quarters of a sound, healthy drove in its stead.

THE TUBERCULIN TEST.

In reviewing the questions of detection and of eradication of tuberculosis in hogs, *it is noticeable at once that there are but few recorded* instances in which reliable tuberculin tests have been made. This may be due to the fact that the temperatures of hogs are subject to rapid changes, under conditions which would not cause noticeable variations with cattle. These alterations in temperatures in individual hogs are so great within short spaces of time and from apparently insignificant causes that it seems at first glance that no change *caused by the injection of tuberculin could ever, guarded from outside* influences, be sufficient to permit one to reach any definite conclusion as to the presence or absence of tuberculosis.

In the experiments of Schroeder and Mohler, of the Bureau of Animal Industry, recorded in Bulletin 88, it was found desirable to keep the hogs as quiet as possible during the test, it having been shown that excitement affects the temperature of hogs very quickly. Each hog was therefore placed in a rectangular crate about twelve hours before the first temperature was taken, and remained in this confinement until the tuberculin test was completed. The crates, while large enough to permit the hogs to get up and down easily, were still close enough to prevent their turning around, or moving backward or forward to such an extent as to interfere with the insertion of the thermometers. Crates that are made 4 feet long, 1 foot 2 inches wide, and 2 feet high, inside measurement, are entirely satisfactory in restraining hogs weighing from 50 to 150 pounds. Unless use is made of crates or of some other satisfactory means of restraint, it is difficult, if not impossible, to obtain trustworthy temperatures of hogs.

The dose of tuberculin used was estimated on a basis of 0.5 c. c. for each one hundredweight or fraction thereof of the weight of the

animals tested. For instance, a pig weighing 75 or 100 pounds would receive 0.5 c. c. of tuberculin, while one weighing 150 or 200 pounds would receive 1 c. c. The injections were made directly under the skin at the inner surface of the thigh, and in no instance were any harmful results noted following the puncture.

For a practical tuberculin test it has been found sufficient to have the temperature of the hogs taken every two hours from 8 a. m. to 6 p. m., inclusive, on the day of injection, and at the same hours on the day following, when the tuberculin injection is made at 10 p. m. on the first day. The temperature before injection should be taken as frequently as after injection, and at corresponding hours, because of the very erratic character of the temperature of hogs and because of the slight circumstances that may inadvertently be the cause of marked variations. It should especially be borne in mind that the value of the results obtained depends entirely upon keeping the hogs absolutely quiet during the whole of the test, and this point may be more readily gained if the animals are kept in their crates for twelve hours, at least, before the first temperature is taken.

In making a decision as to the presence or otherwise of tuberculosis in a hog, as shown by the temperature readings, it is somewhat unsafe to base a condemnation upon the comparison of the maximum reading before injection with the maximum of the day following, but one is enabled to reach very satisfactory conclusions by averaging the temperature for the two days and comparing these averages. It is essential also that the temperatures should be taken at corresponding hours on each day of the test if results are to be determined by means of averages. By this method it was found in a test experiment with 68 hogs that only two failures (less than 3 per cent) occurred. In these tests no hog was condemned as tuberculous until it had shown an average elevation of temperature of at least one degree on the day following the injection.

DISINFECTION.

Having removed all tuberculous cattle, hogs, and fowls from the farm, attention should next be given to disinfecting the premises so that no center of infection may remain to contaminate future purchases of live stock. This is in reality a serious and strenuous undertaking and should be entered into with full determination to do thorough work. The disinfection of pens and stables may be accomplished by thoroughly cleaning them, scrubbing the floors with hot water, brushing down all loose dust from the walls, and tearing out all woodwork which has become partly decayed. The interior of the pens or stables should then be carefully covered with a coating of lime wash containing 1 part of formalin to 30 parts of the lime wash, or 4 ounces of formalin to each gallon of the lime preparation. The

yards should be carefully cleaned at the same time, special attention being given to the removal of all rubbish and litter from the dark, shady corners. Lime, or a 3 per cent solution of carbolic acid, may then be sprinkled upon these dark portions of the yards. In all of the open portions of the yard the action of the direct rays of the sun will very quickly destroy all the virulence of the scattered tubercle bacilli.

The premises now being cleansed, healthy foundation stock may be procured, and if proper attention is given to keeping the cattle of the farm free from tuberculosis and to supplying the hogs with suitable feed, the owner may feel every reasonable assurance that he has seen the last of tuberculosis among his swine. The trouble, time, and expense required will be more than repaid by the advantages gained.

It has been quite conclusively shown that swine acquire their infective tuberculous material from cattle, mankind, or poultry, but principally from cattle. Tuberculosis can not develop spontaneously in swine, but must be acquired from some outside source, and the farmer whose yards and stables have been thoroughly freed from the disease need fear no reappearance of the disease except when introduced from some outside point of infection.

Great assistance will be afforded in keeping tuberculosis away from a farm by the use of concrete in the construction of stables. Its advantages over wood, which may decay so soon, in the construction of floors and walls, can hardly be appreciated except by those who have tried it. Its use affords one added means for combating tuberculosis and freeing our stock from its damaging effects.

FARMING AS AN OCCUPATION FOR CITY-BRED MEN.

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SUCCESS IN MERCANTILE, MANUFACTURING, OR TRANSPORTATION ENTERPRISES.

A study of the history of those men who direct the affairs of large mercantile, manufacturing, and transportation enterprises usually reveals a steady progress from a beginning as a low-salaried employee step by step to positions of greater responsibility, and finally to the position of directing head of the enterprise. The men who thus gradually work themselves up from lower positions are endowed with the spirit of work. In nearly all industries of the classes mentioned the hours of work are so limited that even the most humble employee has some time which he can devote either to recreation or to study. The men who go to the top in business affairs are usually those who do not know what recreation means, but spend their spare time in intelligent preparation for greater usefulness to their employers. Many instances might be cited where men who are now directing large enterprises began at a low salary in a position requiring hard work. The humblest employee in such lines of business has the opportunity, if he has the ability, to rise to a high position.

CONDITIONS AFFECTING FARMERS.

In farming it is different. There are practically only three grades in this business, namely, the farm laborer, the tenant, and the proprietor. While it is possible for the laborer to become a tenant, and then by careful study and great frugality ultimately to become an independent proprietor, or even to become a proprietor directly, in a small way, from his savings as a farm laborer, generally speaking there is not the opportunity in farming for the laborer to pass by gradual steps to a position of importance in the industry, because we do not ordinarily find series of positions, with graduated salaries, which form the stepping stones for the ambitious and able young man. In the first place, on the average farm there is little or no profit; that is, if we count out wages for the

farmer and his family and interest on the investment, there is usually no balance, and on many farms the balance is on the wrong side of the ledger.

To state the reasons for this condition of affairs would lead us too far away from our present purpose. It will suffice here merely to state that ordinarily profits in farming are not large, and that therefore farm wages are not high. It takes several years of self-denial and careful saving for the farm laborer to lay by enough to become a tenant or a small proprietor. Nevertheless, this has been done repeatedly and can be done if the laborer has sufficient intelligence and determination.

LIMITED OPPORTUNITIES OF THE FARM LABORER.

As a farm laborer a young man has some chance to study agricultural literature and to learn many necessary details of farming, without which knowledge it would be unwise to undertake farming as a means of livelihood. But the opportunity for study on the part of the farm laborer is not as great as it ought to be. Many farmers attempt to overcome low profits by long hours of labor instead of by intelligent study of the details of their business. Comparatively few farmers limit the hours of labor in such a way as to give time for a proper study of their business. Under ordinary circumstances, therefore, it is hardly practicable for the ordinary city employee to become a farmer through the position of farm laborer. In the first place, even the farm laborer must have a knowledge of details which it takes some years of experience to acquire, in order to make his services of value to the farmer. In the second place, the standard of living of the average farm laborer would greatly discourage the city-bred family. Yet where it is possible to secure employment with a view to learning the details of farming, it is wise to do so, provided the city man who is trying to break away from the city and get on to the land has the courage to undergo the hardships incident to such a change—speaking, of course, of the man who has little or no capital with which to begin business for himself.

CONDITIONS THE CITY MAN MUST MEET IN FARMING.

It is still less feasible for the city man with no knowledge of farming to begin as a tenant farmer. The tenant must pay rent and must know how to farm in order to make ends meet. To move from the city to the country, with no capital, would appear, therefore, to be a very serious undertaking, and the writer would not advise city people to undertake it. However, if a small capital has been saved up the move can be made; but in practically all cases the beginning should be made not as a farm laborer or as a tenant, but as a small proprietor, the size of the establishment depending, of

course, upon the capital available. It is a good plan for the city man who has the means to take some sort of course in a school of agriculture as a preparation for farming. Schools of this kind are multiplying rapidly in this country. Every State has its agricultural college, and many of the States are building agricultural schools of secondary grade. The latter are particularly valuable to the city man who would learn how to farm, as they give more attention to the practical details of farming than the colleges do, the function of the agricultural high school being primarily to turn out men fitted for farming, while the main function of the college is to turn out men fitted for agricultural investigation and teaching.

AS A GARDENER IN THE SUBURBS.

Whenever it is feasible a very good plan for the city man who has no knowledge of farming and who desires to become a farmer is to move to the suburbs and begin in a small way as a gardener. At first the principal aim should be to produce truck crops for home consumption. As experience is gained the industry may be enlarged and a market established. Many men have made the transition in this manner. Others have started with one or two cows, and have let the business grow from the profits obtained in it. Others have succeeded by beginning in a small way with poultry or fruit. The knowledge gained in this way, both as regards the details of farming and concerning methods of marketing, finally enables the beginner to abandon his city employment and become a farmer.

SOME INSTANCES OF SUCCESS.

A few men have succeeded without this gradual transition. They have moved boldly to the country, put their capital into land, and by hard work, much study, and exceedingly frugal living for a few years, until the business has been learned and a profit assured, have been highly successful. Farmers' Bulletins Nos. 242 and 355, issued by the United States Department of Agriculture, give accounts of two farmers who have succeeded in this manner. Such changes are usually accompanied, for a few years, by the severest kind of hardship; but if the man is intelligent, a close observer, and not afraid of work, it is possible to succeed under such conditions.

An interesting case of this kind came to notice recently. At the Iowa State Corn Show in 1909 the ear of corn which took the grand championship prize, and which sold at auction for $160, was produced by a farmer who ten years previously was a driver of a laundry wagon in the city of Des Moines. It must be recognized, however, that men who have thus succeeded have invariably been men of unusual ability.

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CHANGED CONDITIONS IN RECENT YEARS.

In some respects it is more difficult at the present time to break away from city employment and establish oneself on the land than it was a generation ago. At that time there was plenty of land to be homesteaded. Especially in the Middle West, where most of this land was available, the soil was rich and its fertility needed no attention. It did not take long for the beginner to learn how to grow crops successfully on this rich virgin soil and to make farming distinctly profitable. When good land was thus available for the taking, thousands of farm homes were successfully established by men having little previous knowledge of the business. At the present time there is practically no desirable land left for homesteads. The beginner must buy land usually at a considerable expense. Not only that, but in most parts of the country the land has been farmed so long without attention to fertility that it will no longer produce crops by the slipshod methods formerly in vogue. Experience and a knowledge of principles are therefore much more necessary at the present time than was the case a generation ago. In fact, many experienced farmers to-day are not making a good living for the simple reason that they do not possess the knowledge of the principles involved in their business, and unfortunately only too often the farmer is not aware of his lack of knowledge. The city man has the advantage that he realizes his ignorance and is willing to learn.

On the other hand, agricultural science has developed wonderfully in the last quarter of a century, and the literature of the subject is correspondingly more abundant and more reliable. Hence, the beginner may receive more help from others than was the case a generation ago. The sources of information on which the farmer may draw will be referred to more specifically later in this article.

CAPITAL REQUIRED.

No definite amount of capital can be stated as a sufficient sum on which to begin farming any more than it can be done in the mercantile business. A great deal depends on the price of land and the magnitude of the undertaking. Just as the merchant may begin with a modest stall and a few dollars' worth of goods, so the farmer may begin with 1 acre of land or less, on which he may raise part of the food for his family, eking out a living by working part of the year for someone else, or he might buy a large farm and equip it fully. It may be said, however, and with some assurance, that the man without farm experience and without a knowledge of the principles involved in farming who starts the business on an elaborate scale is foredoomed to failure unless he is so fortunate as to command the services of a trained manager. Furthermore, it is next to impossible

to secure such services. Competent farmers are usually engaged in business for themselves, and our schools of agriculture have not yet fairly begun to supply the demand for men of this class. There is hope, however, that in the not distant future many young men without the capital to start into business for themselves will be trained for the management of agricultural properties, as a few are to-day. When the number of such men is sufficient to meet the demand we may expect an important development of large agricultural enterprises.

We shall not attempt here to deal with the case of the wealthy city man whose farm is to be simply a country home. Usually such farmers spend more in equipment than the farm can ever be made to pay for. It is our aim rather to deal with the case of the man with small or moderate means, who must make his living from the farm. The first and most important principle to get fixed in mind is that of avoiding unnecessary expenditures. The commonest mistake of the city man who undertakes farming is the purchase of equipment which is not necessary to his business. The natural impulse is for the beginner to purchase all he thinks he will need. It is decidedly the best policy, at least until one has become experienced and has a good knowledge of what equipment is necessary, to buy nothing not absolutely essential until the farm begins to pay. After that one may do as he likes with the profits of his farm.

EQUIPMENT.

The question of farm equipment has been little studied, the only deliberate study of such equipment known to the writer being that inaugurated by the Office of Farm Management a few years ago. It is a very complex and difficult subject. The character and amount of equipment are determined by many elements, such as climate, the character of the crops grown, the kind of live stock kept, the character and condition of the soil, and the extent of farming operations undertaken. Even if complete knowledge of farm equipment were available, it would be impossible in an article as brief as this to outline the subject in full, because it is too extensive. Yet, when the farmer has chosen his location and determined upon the type of farming he is to follow, the Office of Farm Management can give him a good deal of valuable information concerning the equipment he will need. We hope at some future time to have an ample list of publications on this subject.

TYPES OF FARMING.

Perhaps the most important point the beginner must decide is the type of farming to be followed. This question is discussed at length in an article in the Yearbook of the Department of Agriculture for

1908, pages 351 to 366. It gives a general discussion of practically all the types of farming found in the United States, and suggestions are made about those types best suited to beginners. There is also some discussion of the amount of equipment required.

One important consideration, which is not brought out in the article referred to, is that, if in a community the farmers generally buy a commodity they can produce, the price of that commodity will be high and its production profitable. A conspicuous example is found in the tobacco and cotton growing regions, where the farmers usually buy their hay. This hay is produced in the North, and the high freight rate on so bulky a commodity causes it to be high priced. Occasionally one finds in those regions a farmer who devotes most of his energies to the production of hay. Such farmers usually make more money than their neighbors who buy hay. In fact, hay growing is a fairly simple type of farming that is usually profitable, and there are extensive regions in the United States where hay growing is the best type of farming for the beginner, provided he has capital enough to begin on a considerable scale. The principal difficulties met with in this type of farming are that considerable equipment is required and a considerable area of land is necessary from which to secure an adequate income for a farm family. The curing of hay, so as to be able to put on the market a good quality of this product, is also something which can not be learned entirely from books, but requires considerable experience for its successful conduct. On the other hand, the hay crop is fairly certain if the right crops are chosen, and if large yields are obtained the returns are good.

SOURCES OF INFORMATION.

Farming requires not only experience but a great deal of detailed knowledge of many things. For instance, one must be able to judge when the soil is in condition to be plowed or tilled. This is especially the case on heavy soils. If a clay soil is handled while it is wet and dry weather supervenes, the soil becomes baked into hard clods, which rain alone can pulverize. On the other hand, if it is plowed when it is too dry, a clay soil breaks up into large lumps, on which it is of little use to plant any kind of crop. But if the plowing be done when the soil is of a proper consistency, clay soils pulverize readily and the subsequent tillage operations are simple. On sandy soils one does not need to give so much attention to the condition of the soil for plowing or tilling, though even on this class of soils some experience in soil management is necessary in order to secure the best results.

The farmer must also understand how to maintain the fertility of the soil; hence he must have a knowledge of fertilizers, of manures, of the effect of lime, etc. He must also know the nature of many

kinds of plants and understand their requirements. In practically all kinds of farming some live stock are necessary, and the farmer must know how much shelter these stock require, what kind of food they need, how much, etc. He must also know the time to plant and to harvest, and how to secure and manage labor, unless he is so fortunate as to be able to dispense with hired labor.

Part of this knowledge may be obtained from books, but a great deal of it can be obtained only by experience. This is especially true as regards knowledge of the soil. Even the agricultural scientist does not yet know all about the soil, and the best books on the subject leave much to be learned by experience.

In most communities the beginner can gain much information from his neighbors, especially about the time of planting and harvesting, when the soil is in condition for plowing and tilling, the amount of feed necessary for his live stock, etc. On the other hand, one's neighbors are often poor advisers, especially if the new farmer is attempting to do something which has not before been successfully done in the community. The average farmer is inclined to discourage innovations of all kinds and is ready to predict failure of new methods and of men new at the business.

Fortunately, agricultural papers are abundant, and many of them are very reliable in what they teach. Every farmer should take several of these. Some of the best farm papers relate to general farming, while almost every phase of farming is discussed by special journals. For instance, there are numerous journals devoted to poultry, and practically every kind of stock has one or more journals devoted to it. There are also good journals which give special attention to truck growing, fruit growing, and the like. It is a good plan for the farmer to take one or two of the best of the journals devoted to general farming in addition to a few of the special journals relating to the phases of farming which he is practicing.

THE AGRICULTURAL EXPERIMENT STATIONS.

In every State there is an agricultural experiment station which issues bulletins on various phases of farming. These bulletins are sent free to all applicants in the States where they are published. Some of the stations send bulletins to farmers in other States.

UNITED STATES DEPARTMENT OF AGRICULTURE.

In addition to bulletins from the experiment stations, the United States Department of Agriculture issues an extensive series of bulletins covering very many phases of farming. Most of these bulletins are sent free to all applicants. This is especially true of the series known as Farmers' Bulletins, of which there are now several hun-

dred. There is probably no farmer in the country who will not find some of these Farmers' Bulletins highly valuable. Complete lists of all the publications of the Department of Agriculture may be obtained for the asking, and from these lists such publications as are desired may be selected.

FARMERS' INSTITUTES.

In practically every State farmers' institutes are conducted. These are meetings of farmers at which various agricultural questions are discussed. The speakers are usually practical farmers who have made a distinct success of their work, or trained agriculturists who have a wide knowledge of agricultural conditions in the State. The most experienced farmer finds these institutes of great value.

MOVABLE SCHOOLS OF AGRICULTURE.

In some sections of the United States traveling instructors are provided either by the State or by the United States Department of Agriculture. This is especially the case in the cotton-growing States and in dairy communities in the Northern States. Some of the States maintain traveling dairy schools, which go about from place to place giving a short course of practical demonstrations in the handling of milk, the manufacture of butter, the use of dairy apparatus and machinery, etc. These demonstrations are usually accompanied by lectures on the feeding and care of dairy cows and other kindred topics. In a good many of the corn-growing States in recent years special corn schools have been held during the winter season, when the farmers can best attend them. As the price of farm land rises and the original fertility of the soil is exhausted, schools of this character become more and more necessary. There will undoubtedly be an extensive development of instruction of this character in the near future.

CORRESPONDENCE.

In addition to the sources of information already outlined, farmers can usually secure much valuable information by correspondence with the state agricultural colleges and the United States Department of Agriculture. A number of the agricultural colleges maintain correspondence courses in agriculture. There are also some private schools which do the same. Nearly all of the agricultural colleges, at some time during the winter season, offer special short courses in practical agriculture. The expense of attending these short courses is nominal, and the information to be gained makes attendance well worth while. Such courses are of more help to the experienced farmer than they are to the beginner, for the reason that the information given can not be assimilated without some farm experience.

AGRICULTURAL HIGH SCHOOLS AND COLLEGES.

The agricultural high schools and colleges have already been mentioned. In recent years the attendance at these schools from the cities has shown a marked increase, and, where one has the means, it is an excellent plan to take a course at such an institution before attempting farming. While taking this course it is highly desirable that the student spend his vacations at farm work.

BOOKS ON FARMING.

The number of books published relating to various phases of farming is very extensive; so much so, in fact, that the farmer is at a loss to know what books to buy. He can secure much valuable advice on this point by corresponding with the agricultural colleges and the Department of Agriculture at Washington, D. C.

DEPARTMENTAL AND PRIVATE AID.

A few years ago there was established in the Bureau of Plant Industry of the United States Department of Agriculture an Office of Farm Management. In many cases the employees of this office are able to render valuable service to farmers by way of advice concerning types of farming to undertake, equipment to buy, crops to grow, the relative acreage of these crops, how to secure good seed, etc. Representatives of this office are found in most of the States.

More recently a number of men have established themselves as agricultural experts, who visit farms and give advice on many phases of farm management, charging fees for such services.

ADVANTAGES OF A FARMER'S LIFE.

While it has been necessary in this article to dwell more particularly on the difficulties confronting the family who would change from some other business to farming, the advantages of farming must not be overlooked. In the first place, the farmer, if he is at all successful, has no fear of being displaced. He commands his own time and leads an independent life. In the second place, if he is wise, he may himself produce nearly all the food necessary for his family. He may maintain a good garden, an orchard, a flock of poultry, keep a few cows and pigs, and grow most of his own bread. If the wife and daughters know how to prepare food in an appetizing manner and understand how to be frugal, the actual money expense for the farm living may be made very small, while at the same time the standard of living, from the standpoint of food, may be much higher than is possible even with wealthy people in the city.

The income from farming depends more upon the farmer himself than it does upon any other one factor. An intelligent man who

must depend upon his own labor may live well on the farm after he has acquired a satisfactory knowledge of the business. If he can command considerable capital he may profit by the labor of others, and if his capital is large enough and he is a good business manager he may live even luxuriously. But the beginner, even with considerable capital, must be prepared to bear some hardships while he is learning the business.

INTRODUCTION OF THE HUNGARIAN PARTRIDGE INTO THE UNITED STATES.

By HENRY OLDYS,
Assistant, Biological Survey.

During the years 1908 and 1909 nearly 40,000 partridges have been transplanted from the game covers of Europe into those of America. Previous to 1908 less than 8,000 had been imported. This sudden and strong tide of popular favor for the partridge has created a demand for information concerning it.

In general, attempts to acclimatize foreign birds and mammals have been unsuccessful, or, if successful, have proved disastrous. The English sparrow in America, the mongoose in Jamaica, and the rabbit in Australia are notable examples of disastrously successful acclimatization, while the attempted establishment of the European quail in the United States and Canada thirty years ago is a well-known instance of expensive failure. On the other hand, the introduction of the pheasant into Europe, St. Helena, Australia, New Zealand, and recently into the northwestern part of the United States, of the gray partridge into Norway and Sweden, and the reintroduction of capercailzie into Scotland show that under some circumstances acclimatization may be successful and beneficial.

The present popularity of the European partridge for introduction into American covers may be justified by future developments, but the history of past experiments does not lend encouragement to such a view. The first widespread effort to establish a foreign game bird on American soil occurred from about 1877 to 1881, when a number of sportsmen of the eastern part of the United States and Canada undertook the importation and liberation of the migratory quail of Europe—Messina quail, they were generally called, as the supply was obtained from Messina, Italy. In three or four years several thousand of these small quail were brought from Italy and liberated in Iowa, Maryland, New Jersey, New York, New England, Ontario, Quebec, and elsewhere. The experiments failed. The birds mated, built nests, and reared young, but practically all disappeared with the autumnal migration.

The interest excited by the efforts to replenish our covers with European quail led to attempts to introduce various exotic game birds,

especially in Illinois, the game laws of which were soon modified so as to protect, in addition to native birds, such unusual species as the sand grouse and chukar partridge of India and the red-legged or French partridge of Europe, as well as ringneck, English, versicolor, golden, silver, and copper pheasants, and those gorgeously colored pheasants known as tragopans. Indiana protected several of these same species, while Maine and New Hampshire added the black game and capercailzie of Europe to their list of protected game. Most of these birds disappeared shortly after liberation. Meanwhile, in 1880–81, Oregon made its now celebrated attempt to acclimatize the ringneck pheasant. The success of this introduction revived the spirit of acclimatization, and pheasants, both ringnecks and English ringnecks, were quickly introduced into nearly every State in the Union and most of the Provinces of Canada. For more than twenty years determined and painstaking efforts have been made to establish these pheasants in America; but with the exception of a few regions, such as the Willamette Valley in Oregon, several circumscribed localities in Washington and British Columbia, the Genesee Valley in New York, and possibly one or two other places, it is safe to say that the pheasants surviving in the United States and Canada not in private preserves have cost (on the basis of dividing all expenses of the experiments by the number of living birds) not less than $50 apiece. Furthermore, the few that are left will probably soon disappear if the stock is not replenished by fresh liberations.

The unsatisfactory results of these ventures, together with one or two bad seasons for two of our principal native game birds, the bobwhite and the ruffed grouse, have turned attention to the European partridge; and this interest has been intensified by the inability of Northern States to procure bobwhites for restocking depleted covers, owing to the recent adoption of stringent nonexport restrictions by Southern States, the source of former supplies. But the failures of the past make it wise to consider carefully whether the partridge is better suited for acclimatization than were its predecessors in favor.

CONFUSION OF NAMES.

Most of the partridges recently imported from Europe are known as Hungarian partridges. Other names have been applied to various consignments, such as English partridge, European partridge, Bohemian partridge, German partridge, and German quail. These birds, however, all belong to the one species, *Perdix perdix*, ordinarily known as the gray partridge, in contradistinction to the red-legged partridge (*Caccabis rufa*) of southern Europe (sometimes called the French partridge). While there is no specific distinction among

the partridges imported from different parts of Europe, there are certain differences recognized by the trade which appear to be substantial. It is generally agreed that the partridges of Hungary and Bohemia are larger and hardier than those of England. This point of view was well expressed by the writer of a recent article in the London Field, who says:

> The advantage of turning out Hungarian birds can not be overestimated. They are suitable from every point of view—stronger and hardier than our native birds and therefore more capable of rearing large coveys. As an example of their hardiness, I may mention that last autumn two coveys of these birds found their way to an elevation of 2,000 feet on the Badenoch moor, having been reared on the arable ground below. There they wintered, and in spite of the snowstorms throughout January are still apparently in good condition.[a]

The writer adds that Hungarian birds seem to be less dependent on the proximity of arable lands than the native British partridge. These differences may perhaps be accounted for by the fact that the birds of Hungary and Germany have not been so closely interbred or so closely confined as those of English preserves, or even those at large in English coverts. Such differences doubtless exist between partridges of different sections throughout their range; it is well known that birds are influenced in size, coloration, and other characteristics by their environment. Such variations may be made serviceable in improving stock, but in the absence of specific differences will probably disappear in time, so that Hungarian partridges bred side by side with English partridges will be indistinguishable from them in the course of a few generations.

RANGE.

The gray partridge (*Perdix perdix*, Pl. XIV) nominally occupies a large territory. Its range extends from the British Isles and northern Portugal on the west to the Barabinska Steppes and Altai Mountains of central Asia on the east, southward to Naples, northern Greece, the Caucasus, Asia Minor, and northern Persia, and northward to southern Norway and Sweden and south central Russia. The climate in this range corresponds in large degree to that of the eastern half of the United States, excepting the Gulf States and the extreme northern part—that is, the Transition and Upper Austral life zones.

SIZE.

In size the partridge is between the bobwhite (our southern 'partridge') and the ruffed grouse (our northern 'partridge'), as is shown by the comparison given in the table on the following page.

[a] London Field, CXIII, p. 786, May 8, 1909.

Comparative sizes of bobwhite, gray partridge, and ruffed grouse.

	Length.	Extent.	Weight.
	Inches.	*Inches.*	*Ounces.*
Bobwhite	10-10½	14½-15	5½- 6½
Gray partridge	12-14	18 -22	12 -18
Ruffed grouse	16-18	23	30 -40

HABITS.

Whatever differences in weight and strength there may be between the Hungarian partridge and the ordinary partridge of England, their habits are practically the same. Like the bobwhite, the partridges of Europe sleep on the ground in circular groups with heads pointed outward, ready to detect an enemy in any direction and to scatter to all points of the compass should danger threaten. Wheat, clover, millet, and potato fields are said to be favorite feeding grounds. Their food, like that of the bobwhite, embraces considerable variety, including insects of various kinds (which they apparently prefer to corn), cabbage leaves and other green food, wild berries, and doubtless many other kinds of sustenance furnished by field, forest, and garden.

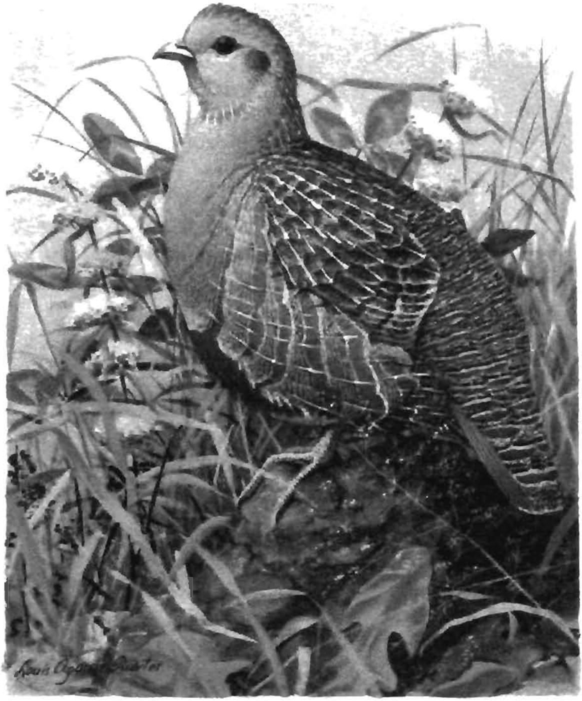
Partridges offer much the same kind of shooting as the bobwhite; when flushed they scatter explosively and may fly a quarter of a mile before lighting; however, they do not usually lie so well to dogs.

NESTING.

Partridges are not polygamous, but separate into pairs in spring and seek places for nesting and for raising their broods. At this time the males are usually exceedingly pugnacious, and each will jealously guard his chosen territory and viciously attack any intruders of his kind. The nest, which is very simple, is constructed in May, earlier or later in the month according to latitude. The number of eggs laid is variable, depending on food supply and weather. In England, under unfavorable circumstances, the hen partridge may content herself with 6, while with more propitious conditions she may lay as many as 20 before beginning the labor of hatching. Sometimes two or more partridges lay in one nest.

The eggs can be readily distinguished from those of the bobwhite and ruffed grouse by their slightly smaller size and their olive color, as contrasted with the white of the bobwhite and the buff of the ruffed grouse. In shape they are a pointed oval.

The period of incubation is said to be from 21 to 26 days, but the former number is probably more nearly normal than the latter. The chicks are prettily marked with dark longitudinal stripes on



HUNGARIAN PARTRIDGE.

head and back, like young bobwhites, and, like the latter, become indistinguishable in the field from adults when, with cold weather, the scattered coveys unite into large flocks.

THE HUNGARIAN PARTRIDGE IN ENGLISH PRESERVES.

The utility of the Hungarian partridge in improving stock was discovered by the preserve owners of England a decade ago, and by 1904 was believed to have been thoroughly established. A contributor to the Field in that year says:

> The value of Hungarian partridges has of late years been fully demonstrated, and their introduction has now long passed the experimental stage. Several shootings might be mentioned where within the last decade the bags have been doubled, and even trebled, where 200 brace are now killed in a day on beats which formerly yielded at most 120 head. The adoption of driving is partly responsible for such marked improvement, but in all cases the owners and keepers are satisfied that the extensive introduction of Hungarian partridges is at the root of the whole matter.[a]

About five years ago the rearing of partridges in confinement (known as the French method) was suddenly and generally introduced in England. By this method, which has been practiced in France and probably in parts of Holland for a quarter of a century, the partridges are confined in a central cage. The individual birds are distinguished by differently colored bands of ribbon on the legs, so that their predilections may be more satisfactorily noted. When the mating season arrives, the pairs are allowed access to side pens, which radiate from the general pen. As soon as a pair retires to one of these breeding pens, communication with the main pen is cut off, and the birds are left to breed in seclusion, protected from enemies and inclement weather. When the chicks are a few days old, they and the parent birds are liberated.[b]

Despite the attempt in England to improve stock by the introduction of Hungarian partridges, and notwithstanding the adoption of the French method of rearing, the partridge shooting has steadily grown poorer during the past few years, a condition which a recent contributor to the London Field suggests should be investigated, as it is not due to rainy seasons, poachers, or vermin. The growing custom of 'driving' partridges may be responsible, at least partly, for the decrease of birds. Where driving is practiced, beaters are sent through the coverts to flush the birds, while the 'guns' (shooters) are stationed outside and shoot the birds as they fly overhead from one covert to another. By this method it is possible to secure a

[a] Hungarian Partridges, by H. B. M. London Field, CIV, p. 960, Dec. 3, 1904.

[b] An interesting account of this so-called French method of rearing partridges, originally contributed by C. J. Cornish to the Cornhill Magazine, appeared in Forest and Stream, LXIII, p. 198, Sept. 3, 1904.

larger percentage of the birds than by 'walking up' or shooting over dogs, and the temptation to increase the bag beyond a safe limit is very strong. The season of 1909 was particularly poor; on some of the best grounds in England coveys did not average the usual number of birds and were in much poorer condition than they should have been. On the higher and drier land they did fairly well, but even there the coveys were reported to be much smaller than usual.[a]

THE HUNGARIAN PARTRIDGE IN AMERICA.

Owing to the confusion of names, it is impossible to separate with certainty the Hungarian from the English partridges in the records of importations into America, but the earliest attempt to introduce the Hungarian partridge as such into American covers seems to have been made in 1899,[b] when 24 birds brought from Europe were placed on a private preserve at Lynnhaven, Princess Anne County, Va. This venture was subsequently transferred to Montague, Essex County, Va., and fresh importations were made until by 1906 about 180 birds had been brought over. Meantime, sportsmen and preserve owners in other States were making occasional importations. In 1900, 97 of the birds were imported and liberated in the Willamette Valley, Oregon, where the ringneck pheasant had been successfully introduced a few years previously; in 1904, 192 were liberated on Hilton Head Island, South Carolina, and 57 in Fraser Valley and other places in British Columbia; in 1905, 20 were placed on a preserve in Massachusetts, and 91 on one in North Carolina; in 1906, besides a fresh lot that went to the Virginia preserve mentioned, birds were placed on preserves in New York, New Jersey, Pennsylvania, North Carolina, and Mississippi. In addition to these, which consisted of comparatively small consignments, 1,000 were imported in 1906 by the state game commissioner of Illinois and 200 by the state game warden of Kansas for restocking the covers of those States. The last two importations are apparently the earliest official efforts to introduce the Hungarian partridge into any State. In 1907 about

[a] London Field, CXIV, p. 465, Sept. 4, 1909.

[b] As far back as the latter part of the eighteenth century the gray partridge had been introduced into the United States by Richard Bache, son-in-law of Benjamin Franklin, who stocked his place on the Delaware River, near the present town of Beverly, N. J., with English pheasants and partridges in large numbers; and attempts were subsequently made from time to time by wealthy landowners in New Jersey and Virginia to introduce these birds, but all were failures. The most elaborate was made by Pierre Lorillard, who established three game preserves of 100, 40, and 25 acres, respectively, on his place at Jobstown, Burlington County, N. J., known as the Rancocas Stud Farm, and put up costly houses for breeding partridges and pheasants, which he imported from England for the purpose. There is now no trace of any of these birds. (Forest and Stream, XXV, p. 103, Sept. 3, 1885.)

2,500 more were brought in for this purpose, and in 1908 the number of official importations rose to 12,000, while in 1909 it advanced to the important total of 27,000. The States thus experimenting with the acclimatization of this popular game bird include California, Connecticut, Delaware, Illinois, Indiana, Kansas, Nebraska, New Jersey, and Washington.

The total importations of partridges from July 1, 1900, to December 31, 1909, are shown in detail in the following table:

Importations of European partridges, July 1, 1900, to December 31, 1909.

Period.	Unspecified.	Hungarian.	Total.	Period.	Unspecified.	Hungarian.	Total.
July 1 to Dec. 31, 1900	315	200	515	1906	311	2,250	2,561
1901	40	20	60	1907	422	2,556	2,978
1902	4	62	66	1908	967	11,875	12,842
1903	72	....	72	1909	1,665	27,425	29,090
1904	23	228	251	Total	4,179	44,797	48,970
1905	364	181	545				

While every effort has been made to insure accuracy in these figures, they are only approximate, because sometimes it is impossible to ascertain the mortality on the ocean voyage, the figures being based in these cases on the number shipped. The mortality en route, under the best care, may be safely placed at 20 to 25 per cent, and is sometimes much greater. Thus, of 400 Hungarian partridges shipped from England in 1906, consigned to the Essex Park Game Preserve in Virginia, only 50 reached their destination alive. While this loss of 350 out of 400 in crossing the ocean and making the land voyage from New York to Essex County, Va., is exceptionally great, other instances might be cited where the percentage of loss was very high, even after the experience derived from ten years of importation. On the other hand, an occasional consignment will come through very well. Thus in a recent shipment of 300 birds from Bohemia to Windsor Locks, Conn., only 5 died.

ACCLIMATIZATION EXPERIMENTS MADE BY STATES.

CALIFORNIA.—Two hundred Hungarian partridges were liberated in California in 1908 and about 1,600 in 1909. These were placed in several counties in both lowlands and small mountain valleys up to several thousand feet above sea level. Coveys of young birds resulting from the 1908 plantings were reported from 9 counties. Interest in the experiment remains unchanged.

CONNECTICUT.—The game commission of Connecticut imported 740 Hungarian partridges in the spring of 1908 at a cost of $2,640

and liberated them in lots of 10 pairs in nearly every county. Since then about 2,500 more have been obtained and liberated. The commission men and the sportsmen of the State are greatly interested and find much encouragement in the number of coveys noted. According to a communication to the American Field of October 9, 1909, the birds seem to have done well during the past breeding season, though their habit of nesting in hay fields has caused the loss of some broods. Arrangements have been made for securing and liberating a large number of Hungarian partridges during the spring of 1910.

DELAWARE.—In Delaware 100 pairs of Hungarian partridges were distributed in 10-pair lots in 1909. No further experiment will be made until the result of these plantings is known.

ILLINOIS.—Since its first importation in 1906, Illinois has imported several thousand partridges for distribution and breeding experiments at the state game farm. The results are yet doubtful.

INDIANA.—The game commissioner of Indiana has distributed several thousand Hungarian partridges throughout the State. He reports that he is receiving favorable accounts of these plantings, and that the birds are staying close to the localities in which they have been placed. The unique plan has been followed of liberating partridges and pheasants on preserves ranging in size from several hundred to several thousand acres and composed of contiguous farms, the owners of which have agreed to protect the birds. Thus far this method seems to have met with more than average success.

KANSAS.—Several hundred Hungarian partridges have been liberated in Kansas in the last four years, but are said by the fish and game department of the State, under date of December 2, 1909, to "have made no showing whatever."

NEBRASKA.—In Nebraska the chief deputy game warden secured about 250 Hungarian partridges in the latter part of 1907 with funds raised by popular subscription. The birds were distributed throughout the State and appear to have done well. The warden reports that he has information of large coveys of birds at all these plants except three not heard from.

NEW JERSEY.—About three years ago a few pairs of Hungarian partridges were liberated in New Jersey by the Essex County park commission, but the results were not satisfactory. In 1909 the fish and game commission distributed 800 partridges in small lots to persons agreeing to look after them, but the birds failed to multiply as rapidly as had been expected, and it was the opinion of the commission that 1,353 pheasants liberated at the same time had done better than the partridges. The experiment will be continued in 1910, and arrangements have been made for the liberation of 3,000 partridges and 4,000 pheasants.

WASHINGTON.—More than 2,000 Hungarian partridges have been liberated in Washington in the last three years, principally by county game wardens. It is reported by a contributor to the American Field of December 4, 1909, that along the northern border of the State Hungarian partridges have become almost as plentiful as pheasants.

CONCLUSION.

While most of the reports received of these various colonization experiments with the Hungarian partridge are favorable, persons interested should not be too sanguine of ultimate success. Similarly favorable accounts were received after the attempted acclimatization of the migratory quail of Europe and of English and Asiatic pheasants. In fact, the general rule in all such experiments is unexpected success at the outset, followed sooner or later by equally unexpected failure. After multiplying with surprising rapidity, the subjects of such experiments usually disappear with corresponding rapidity. Rev. H. A. Macpherson, an English authority, says with reference to attempts to colonize the partridge:

> The partridge solves the problem of existence better, on the whole, than might be expected, though we do not mean that every attempt to introduce partridges is likely to succeed, for such experiments have failed signally, even when outward circumstances appeared to be most promising. On the contrary, some attempts at the colonization of partridges proved full of disappointment, the strange stock becoming extinct in a very short time and leaving no trace of its existence. The same may be said, however, of almost any species that we try to naturalize in a strange locality.[a]

Not only is acclimatization of an exotic species difficult, but it may, if successful, lead to unexpected results. Birds and mammals often disclose new traits on colonization in a strange land. Thus the skylark, chaffinch, yellowhammer, blackbird, linnet, and other small songsters of Europe, which are more or less innocuous in their native land, became such pests when transplanted to New Zealand that they receive regular consideration in agricultural reports under the head of 'The small bird nuisance.' It is possible that successful acclimatization of European game birds might be followed by changes of characteristics that would lower their value as objects of sport and perhaps render them objectionable to agriculturists.

The possible effect on native game birds of the successful introduction of the partridge should also receive careful consideration. The partridge is pugnacious at breeding time, and, while there is small probability of its killing our native birds by direct assault, its presence may create a struggle for nesting places that will prove serious, at least to the bobwhite.

[a] The Partridge. By Rev. H. A. Macpherson, Fur and Feathers Series, p. 5, 1893.

The experiment has already been a costly one. At $6 a pair (a low average price) the birds brought in have cost $150,000, an amount with which much might have been accomplished had it been applied to the restoration and protection of our native game birds. American birds are already adapted to American conditions, and their value is well proved. They hold a place in the estimation of sportsmen that can not be rivaled by any introduced bird, and the farmer appreciates the important service they render as destroyers of insects, in which the bobwhite particularly is almost unequaled. The Hungarian partridge may never satisfactorily adapt itself to conditions in this country; or it may develop objectionable traits. Hence it would seem wise to devote less energy and money to the establishment of this and other exotic species and give more attention to the restoration and maintenance of our native game birds.

THE FUTURE WHEAT SUPPLY OF THE UNITED STATES.

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Because of the scarcity of wheat and accompanying high prices in recent years, there has been considerable discussion of the question of future wheat production in this country. Doubts have even been expressed by some that we shall be able much longer to furnish our own people with sufficient wheat for bread. Others, on the contrary, contend that high prices will induce a revival of interest in wheat cultivation, and that a large acreage in the older States, devoted to other crops because of previous low prices of wheat, will be again planted with that cereal. This, together with the possible increase of acreage in the undeveloped lands of western States and the increase in acre yields likely to follow improvements in the crop and in methods of culture, will, it is claimed, enable us to maintain an abundant supply for an indefinite time.

In this article the attempt is made to reach as near as possible the proper viewpoint of the question, after an analysis of recent conditions as to production, export, home consumption, etc., and comparison of these with future probabilities in the same lines. Analogies are also drawn from conditions now existing in other countries.[a]

RECENT CONDITIONS.

Evidently any calculation of future wheat production and its relation to consumption must be based chiefly upon inferences that may be drawn from present and past conditions, it being a generally accepted proposition that the average trend of things in future will be about the same over a considerable period of time as in the past.

The total land area of the United States is 1,900,947,200 acres. Ten years ago considerably less than half of this area was included in farms, a little more than one-fifth of the area was improved, and less than 3 per cent was devoted to wheat culture.

In the following table are given the total farm acreage, the improved farm acreage, and the wheat acreage of the United States for each census year that they were determined from 1850 to 1900, also the percentage that each of these comprises of the total land area. The facts are taken from the Statistical Abstract of the United States

[a] The writer acknowledges great assistance rendered by officials of the Bureau of Statistics.

for 1908, pages 119–121, except wheat acreages, which are calculated as 10-year averages from regular reports of the Bureau of Statistics of this Department.

Year.	Farms.		Improved.		Wheat.	
	Acreage.	Percentage.	Acreage.	Percentage.	Acreage.	Percentage.
1900	838,591,774	44.1	414,498,487	21.8	41,971,000	2.2
1890	623,218,619	32.8	357,616,755	18.8	37,275,000	2.0
1880	536,081,835	28.2	284,771,042	15.0	31,912,000	1.7
1870	407,735,041	21.4	188,921,099	9.9	18,386,000	1.0
1860	407,212,538	21.4	163,110,720	8.6	[a]15,424,496	.8
1850	293,560,614	15.4	113,032,614	6.0	....	....

[a] This sum is the acreage for 1866.

The total farm acreage is the total area in farms, whether in actual cultivation or not, and includes often large stock ranges.

As the wheat acreage is obtained yearly and varies considerably, it is considered that 10-year averages show more accurately its relation to farm acreage than the wheat acreage of the census years themselves. Therefore, for the census years of 1880, 1890, and 1900, averages for the periods 1874–1883, 1884–1893, and 1894–1903, respectively, are employed, and for 1870 the average for the period of 1866–1871, as the figures for wheat acreage in this period do not go back farther than 1866.

The figures of the table show a remarkable expansion in both the improved farm area and the wheat acreage. The question now is, to what extent can we expect such increases to continue.

We have no definite statement of farm acreage since 1900. We have, however, a statement for the period 1900–1908 of the yearly "disposal of public lands for cash." These public lands include original homestead entries as much the larger portion, timber-culture claims, lands obtained with agricultural college and other scrip and under military bounty land warrants, and lands (a comparatively small amount) selected by States and railroads. We may therefore assume these lands to make up much the largest portion of the total additions to farm acreage. The total amount of these lands up to 1908 was 164,159,599 acres. These figures, of course, exclude public lands similarly disposed of in Texas, which, according to the reports of the commissioner of the Texas general land office, amounted to 22,470,856 acres from September 1, 1900, to August 31, 1908. If we then consider the further amounts of such lands added after 1908, and the enormous tracts of railroad lands sold to new settlers in recent years, particularly in Kansas, Nebraska, and Colorado, it appears that at least 200,000,000 acres must have been added to the

farm area from 1900 to the present time. This would bring the total farm area up almost to 1,050,000,000 acres, making the percentage of the total land area in farms in 1910 approximately 55 per cent.

The area in cultivated crops in 1909, as reported by the Bureau of Statistics of this Department, was about 10 per cent greater than ten years ago. It is therefore reasonable to believe that at the present time nearly 25 per cent of the total land area is improved. The present average wheat acreage is about 46,500,000 acres, or 2.4 per cent of the total land area.

Up to 1910 these different areas have, therefore, all increased greatly, and apparently at the same rate as in the preceding decade.

It is of interest to note also the percentage of the farm area employed for wheat in succeeding census years. In 1870 the average wheat acreage was 4.5 per cent of the farm area, in 1880 it was almost 6 per cent, in 1890 it was practically the same as in 1880, in 1900 it was 5 per cent, and at the present time approximately 4.4 per cent. The percentage remains almost the same as in 1870, but stood much higher from 1880 to 1890, during a period of unusual expansion in wheat acreage, and fell again in 1900 and later years, during a period of proportionally greater expansion in farm area. This percentage is likely to get larger soon, as the farm area, of course, can not increase indefinitely and is likely even, during the next decade, to increase less than heretofore. On the other hand, there has apparently already begun a considerable expansion in wheat area.

PROBABLE FUTURE WHEAT ACREAGE.

The trend of all these areas, it is seen, is constantly toward an increase, though, as stated, the rate of increase of farm area will hereafter become much less. The percentage of farm area improved and that devoted to wheat will become correspondingly greater, until the farm area finally reaches its limit. What is this limit likely to be? To be more definite, what will be the probable farm area in 1950?

According to the Report of the General Land Office for 1908 there remained at that time, exclusive of Alaska, 386,873,787 acres of government lands "unappropriated and unreserved." Probably 75,000,000 to 100,000,000 acres of these lands will be included in farms. There will be other additions from present Indian reservations,[a] from western Texas, from the reclamation of swamp lands, etc. Add to these the natural expansion of farm area in the older

[a] At the close of the fiscal year 1908 there were 52,013,010 acres of Indian lands, "unallotted and unreserved." See Report of Commissioner of Indian Affairs, 1908, pp. 149-164. These are generally better than the usual run of western lands.

States, which amount will hereafter be proportionally greater than heretofore, and it seems reasonable to expect nearly 300,000,000 acres additional farm area in the next forty years, making a total amount of over 1,300,000,000 acres, or about 70 per cent of the total land area.

The improved farm area has heretofore been about half of the total farm area, but will hereafter increase more rapidly than the latter. It should therefore reach at least 40 per cent of the total land area, or about 760,000,000 acres.

As before stated, the present wheat acreage appears to be approximately 4.4 per cent of the farm area, a slightly less proportion than in 1870. By 1950 the proportion should easily reach 6 per cent, as that rate was attained before in 1880 to 1890, and the farm area will hereafter increase less rapidly. That percentage will allow a wheat acreage of about 80,000,000 acres. Figure 4 illustrates about the conditions that should exist by 1950, based upon conservative estimates.

ANALOGIES FROM FOREIGN COUNTRIES.

Some confirmation of the preceding estimates may be secured, reasoning by analogy from conditions now existing in other countries.

In the accompanying table are given the total land area, the wheat acreage, and the percentage of total land area in wheat in a number of other important countries. The wheat acreage in each case is an average for ten years, 1899–1908.

Country.	Total acres.	In wheat.	Percentage in wheat.
Great Britain	[a] 56,787,082	1,745,000	3.1
Austria	74,102,001	2,742,000	3.7
Hungary	80,979,000	9,044,000	11.2
Belgium	7,277,000	[b] 390,000	5.1
Bulgaria	23,797,000	1,990,000	8.4
Denmark	[c] 9,500,000	90,000	1.0
France	130,374,000	16,100,000	12.3
Germany	133,585,000	4,610,000	3.5
Italy	[a] 70,787,000	11,660,000	16.5
Japan	94,499,000	1,100,000	1.2
Netherlands	8,038,000	140,000	1.8
Roumania	32,444,191	4,690,000	14.5
Russia in Europe (exclusive of Poland)	1,244,367,000	48,550,000	3.9
Poland	31,451,000	1,240,000	3.9
Servia	11,931,000	895,000	7.5
Spain	124,616,000	9,100,000	7.3
United States (continental)	1,900,947,200	46,500,000	2.4
Argentina	714,918,000	14,000,000	1.9
British India	556,599,000	27,000,000	4.9
Manitoba	41,169,000	[d] 2,700,000	6.6

[a] Area including water.
[b] 1904, 1905, 1906 averages.
[c] Area exclusive of lakes and rivers.
[d] Approximately.

It is seen that the percentage of the total land area in wheat runs from 1 per cent in case of Denmark to even 16.5 per cent in case of Italy. *It would require only about 4.2 per cent of the total land area in the United States to give us 80,000,000 acres of wheat.* Yet Spain, which is considerably mountainous, is now

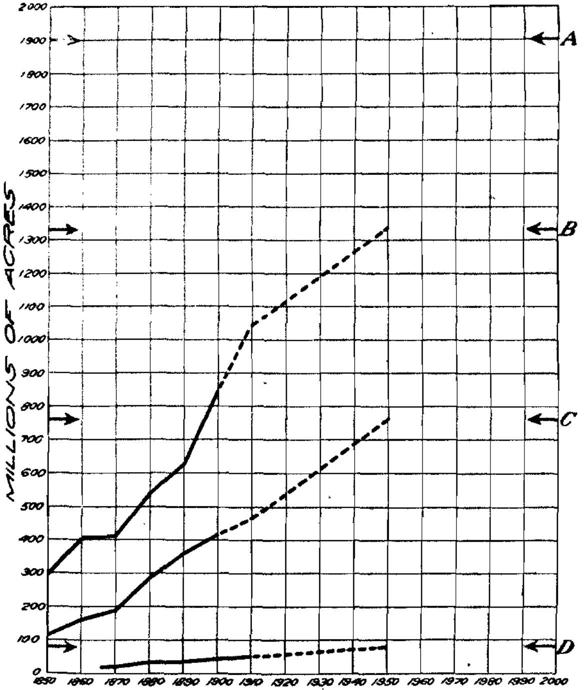

FIG. 4.—Diagram showing increases in farm area (upper line), in improved farm area (middle line), and in wheat acreage (lower line) that may occur by 1950, conservatively estimated. *A*=absolute limit of land area; *B*=probable farm area in 1950; *C*=probable improved farm area in 1950; *D*=probable wheat acreage in 1950.

employing 7.3 per cent, while even in Germany, where there is much waste land, the present proportion is 3.5 per cent, though rye is the really important crop, comprising 10 per cent of the total area. Some of the countries noted for wheat growing, such as Russia, Hungary, Roumania, Bulgaria, France, and Italy, employ from 3.9

to 16.5 per cent of their total area for wheat. Even in Great Britain, where there is the most intensive cultivation, wheat is grown on 3.1 per cent of the total area.

In England about 75 per cent of the land area is cultivated. In Germany 48.7 per cent is arable, while in France 85 per cent is productive. In face of these facts it certainly seems very conservative to estimate 70 per cent of our total area as the area in farms and 40 per cent as the improved farm area in 1950.[a]

It may be added that in Hungary, one of the important wheat countries, but much older than our own, the wheat acreage has increased even since 1884 from 6,797,800 acres to 9,474,415 acres in 1908. In Austria proper during the same period the increase was from 2,735,600 acres to 2,959,557 acres. In total European Russia the acreage has increased from 39,711,200 acres in 1894 to 62,766,700 acres in 1908. In three other smaller countries wheat acreage increases have been as follows:[b] Roumania, 2,903,700 acres (1886) to 4,452,000 acres (1908); Bulgaria, 2,167,200 acres (1897) to 2,422,700 acres (1908); Servia, 783,500 acres (1893) to 931,300 acres (1908).

SUPPLY AND DEMAND, OR THE FACTOR OF PROFIT.

In estimates of this kind, forecasting probable production, it is of course taken for granted that there will be sufficient incentive in the way of demand and therefore profit, to keep up the movement of progressive increases. The most decisive question, after all, is simply one of supply and demand. The farmer, like the man in any other business, will grow what pays best. In 1908 to some a wheat shortage seemed very near. But similar periods have occurred before and have been followed by periods of wheat expansion, the higher prices naturally inducing a larger acreage. Here, again, a review of past conditions will show what is probable in the future.

To present the subject clearly, figure 5 is exhibited, showing the course of wheat acreage and prices in the United States for thirty-nine years, from 1870 to 1908, inclusive.[c] The upper line illustrates the acreage, indicated in millions of acres, beginning at very nearly 19,000,000 acres for 1870 and ending at approximately 46,500,000 acres for 1908. The lower line shows the average farm price per bushel annually on December 1 in cents, beginning at approximately 94½ cents for 1870 and ending at very nearly 93 cents for 1908. From left to right each space represents one year in time.

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[a] The above data were published in agricultural statistics, 1907, of the Board of Agriculture and Fisheries, vol. 42, pt. 4, Colonial and Foreign Statistics, London, 1908.

[b] These facts were taken from Bulletin 68, Bureau of Statistics, U. S. Dept. of Agriculture, entitled "Cereal Production of Europe," by Frank R. Rutter.

[c] The facts were obtained from the Yearbook, U. S. Dept. of Agriculture, 1908, p. 608.

Two things of importance may be noted in a general survey of this sheet: (1) That the line of acreages exhibits four rather clearly defined periods: (*a*) A rather rapid trend upward from 1870 to 1880; (*b*) a steady maintenance of high acreages from 1881 to 1892; (*c*) a shorter maintenance of low acreages from 1893 to 1896; and (*d*) a trend upward again from 1897 to 1908; (2) that the range of prices shows an interesting and rather close relation to the changes in acreage, both as to periods and even in the sharper variations in single years.

It is extremely interesting to note how the prices go down as the acreages go up, and vice versa, though this is the perfectly natural thing to expect. There are a few apparent exceptions, and, as usual, these exceptions are more interesting than the rule. In 1881, why should the price rise so high with only a very slight decrease in acreage? On the other hand, in 1898, 1901, and 1906 the increases in acreage are not at all sufficient to justify the great drop in prices, while in the period 1888–1892 the acreage variations are not in accord with the extreme price variations. The simple explanation is that while prices influence acreage, it is production rather than acreage that influences prices, and occasionally, as in these instances, production is not proportional to acreage. In each of these cases, by dividing the actual production by the average acre yield for five years, with the year in question as the middle year of the five, the normal acreage that should have been necessary for this production at the average acre yield is obtained, represented by the broken lines in figure 5. In 1881, for example, with an acreage almost the same as the preceding year, the production fell over 110,000,000 bushels—from 498,000,000 to 383,000,000—the acre yield dropping from 13.1 to 10.2 bushels. The broken lines extending upward indicate high acre yields—over 15 bushels in all cases except that of 1889. The highest total yield was in 1901, 748,460,218 bushels, this and the 1906 yield being the only yields going beyond 700,000,000 bushels. In 1906 we reached also our highest acre yield, 15.5 bushels.

Again, in some instances the acreage and price variations, though apparently interdependent, do not occur the same year. This fact may probably be explained as follows: Several good crops having occurred, the farmer holds his wheat in spite of fair prices, expecting still better, so that an unusual amount is delivered the following year, thus affecting prices of that year instead of the year the crop was grown.

A period of remarkable conditions is that of 1892–1896. For many years a steady high production had been maintained until, in 1892, accumulations beyond the needs of the people assumed tidal-wave proportions and inundated the country with a large surplus of wheat, followed by low prices. This is at least a partial explanation of the great depression in wheat during this period. However, good crops

in other countries permitted no relief through export, a matter perhaps of equal importance. Not only were low acreages not accompanied by high prices, but by extremely low prices, the lowest in our history, 49.1 cents being reached in 1894. In the light of recent wheat scarcity and high prices, it is of interest to look back at these conditions. Wheat became a drug on the market, and in Kansas it was estimated that 4,000,000 bushels of the 1893 crop, or almost one-sixth, were fed to farm animals. It was seriously considered whether "with corn and wheat approximating the same price per bushel it is unprofit-

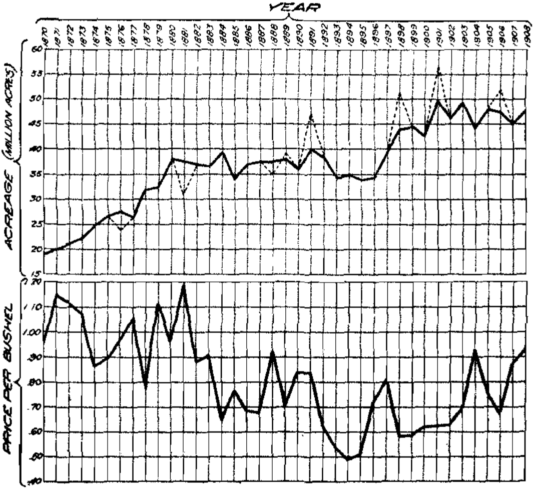

FIG. 5.—Diagram showing variations in wheat acreage and prices for 39 years, from 1870 to 1908. The upper line represents the trend of wheat acreage (in millions of acres) and the lower that of prices (in cents per bushel). From left to right are shown the different years.

able or wicked to feed the wheat." It was quite commonly believed in the Great Plains States, where acre yields are usually low, that wheat growing would never again be profitable.

This period closed only thirteen years ago, and during the preceding period the highest ratio of wheat acreage to farm acreage was attained. Now the trend in acreage is again upward and will continue, no doubt, through another period of wheat expansion. Recent high prices in

the face of big crops (in this country) have probably excited fully as much comment as the low prices in the face of low acreages in 1892 to 1896.[a]

INCREASE OF WHEAT ACREAGE IN OLDER STATES.

It is a natural inference from the preceding discussion that there must occasionally be a considerable increase in wheat acreage hereafter within the present farm area, and particularly in the older States, to allow sufficient production to satisfy unusual demands that will arise. Even since beginning the preparation of this article, a report from the Bureau of Statistics shows that just such an increase in acreage has occurred. This report states an increase in the winter-wheat acreage alone for the season of 1910 of almost 2,500,000 acres over that of last year, the increase being largely in the States east of the Mississippi River.

From further data, partly furnished by the Bureau of Statistics, it is found that in Maryland the proportion of total land area devoted to wheat has increased from 7.5 per cent for the period 1870–1879 to 12.3 per cent for the period 1900–1909. Here follows a tabulation of all States whose percentage of total area devoted to wheat has increased between the same periods above mentioned, with the percentages for each period:

State.	Proportion of total area in wheat.		State.	Proportion of total area in wheat.	
	1870-1879	1900-1909.		1870-1879.	1900-1909.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
Maine	0.1	0.6	Minnesota	3.3	10.5
Pennsylvania	4.4	5.6	Missouri	2.7	4.5
Delaware	5.0	8.9	Nebraska	.9	5.1
Maryland	7.5	12.3	Kansas	1.5	10.5
West Virginia	1.9	2.5	Kentucky	2.7	3.1
North Carolina	1.4	1.9	Texas	.1	.6
South Carolina	.6	1.5	Arkansas	.4	.7
Ohio	6.4	7.2	Oregon	.4	1.3
Indiana	8.0	9.0	California	.2	1.7

While there are large increases in the newer States, as would be natural, it is of more interest to note the considerable increases in some of the older States. It is an indication of what may yet be expected.

[a] In this connection the writer does not overlook the fact that certain changes in the condition of our monetary system have been emphasized as causes affecting prices during periods such as those of 1892–1896 and 1873–1874. That monetary changes do affect prices is no doubt true. However, it should be readily determined with some certainty whether or not such causes do have effect in any instance, since all crops should be affected alike. In the period of 1892–1896, well known to the writer, wheat was depressed far more than other crops. Recently gold has been plentiful, dating back apparently to 1897, making, it is claimed, general high prices, but nevertheless no such scarcity of other important crops existed in 1908 as of wheat.

YIELD PER ACRE.

We come now to another topic, concerning which an erroneous opinion has prevailed for some time. In recent literature repeated statements have been made leading one to infer that acre yields of wheat are decreasing in this country, and in farm journals even the causes of such a decrease have been discussed. As a matter of fact, acre yields, even in this country, are not decreasing, but, on the other hand, have considerably increased, showing that farmers are already giving some attention to better methods of cultivation and using better varieties.

As yields per acre often vary sharply in succeeding years, it is necessary to compare periods instead of single years to get satisfactory information. Ten-year averages of yield per acre in this country, from 1866 to 1905, are as follows: 1866–1875, 11.9 bushels; 1876–1885, 12.3 bushels; 1886–1895, 12.7 bushels; 1896–1905, 13.5 bushels. There is seen to be an increase in acre yields in the last period over the first period of 1.6 bushels. Arranging a different series of ten-year periods, from 1869 to 1908, results are as follows: 1869–1878, 12.31 bushels; 1879–1888, 12.13 bushels; 1889–1898, 13.21 bushels; 1898–1908, 13.75 bushels. Here also is shown an increase in acre yields of 1.4 bushels in the last period over that of the first period. The increase in the last period over that of the second period, however, is 1.6 bushels, practically the same as the total increase in the other calculation. In other words, since 1866, or about 1870, our wheat yield per acre has really increased 1⅗ bushels, and, on the basis of our present average of 46,400,000 acres, is already giving us an increase in production of 74,241,000 bushels above what it would be at the rate prevailing forty years ago.

FUTURE WHEAT PRODUCTION.

At the same rate of increase the added yield per acre by 1950 would be 4⅕ bushels. This increase in acre yields, however, goes on much more rapidly each decade, as there is a more rapid diffusion of knowledge of improved methods of culture and seed selection, use of better varieties, etc. All farming will also become more intensive. Six bushels of actual increase in acre yields by 1950, or about 20 bushels per acre, is therefore surely a safe estimate. Twenty bushels per acre on a basis of 80,000,000 acres, before estimated for 1950, will furnish 1,600,000,000 bushels.

What may occur after 1950 will presumably concern ourselves or the coming generation some other time, but it is practically certain that acre yields will go on increasing, and probably also the acreage. In view of the preceding data showing percentages of total land area devoted to wheat in foreign countries 8 or even 10 per cent of the total

area does not seem an unreasonable limit for this country, and yet it would mean the planting of 150,000,000 to 190,000,000 acres in wheat at some future time. Also, 20 bushels per acre in yield is still much below what is actually being obtained even now in places in Europe. In Germany, where the yield has increased 6 bushels since 1897, it is now (1907) 28.4 bushels. In Great Britain it is 32.6, and even in that country of extremely intensive farming long practiced the increase has been 2.5 bushels (Winchester) since 1897. At least 25 bushels per acre should, therefore, be attained in this country, which, on a basis of 150,000,000 acres, would furnish 3,750,000,000 bushels, and on a basis of 190,000,000 acres, 4,750,000,000 bushels.

HOME CONSUMPTION.

To calculate probable future home consumption of wheat, it is requisite to determine the probable population, and, if possible, the trend of per capita consumption, whether upward or downward, and at what rate. The population of continental United States, the average home consumption of wheat, including seed, and wheat flour, and the per capita consumption for each census year from 1870 are given below. Wheat flour is reduced to wheat at the rate of 4½ bushels to the barrel. The home consumption is an average in each case for five years, of which the middle year is the year preceding that of the census, except in case of 1908, for which an average for the years 1905–1907 is employed.

Year.	Population.	Home consumption.	Per capita consumption.
		Bushels.	*Bushels.*
1870	38,558,371	193,698,324	5.02
1880	50,189,209	276,864,727	5.62
1890	62,979,766	345,602,279	5.49
1900	76,149,386	389,331,530	5.11
1906	[a] 84,024,026	536,706,866	6.39
1908	[a] 87,000,000	551,801,954	6.34

[a] Estimated.

It is seen that the yearly consumption per capita increased from about 5 bushels in 1870 to approximately 5½ bushels in 1880, at which point it remained until 1890, through the period of high wheat acreages already discussed, and then fell again to a little over 5 bushels in 1900. This last five-year period, 1897–1901, follows close after the period of low wheat acreages, low prices, and general financial depression of 1892–1896. If the estimates of population for 1906 and 1908 come near the facts, there was a great increase in per capita consumption after 1900, amounting to about 1¼ bushels. The high per capita

figures would indicate that if the population estimates are much in error they are underestimates rather than overestimates, though they can hardly be so much too small as to bring the per capita consumption much below 6 bushels. These per capita figures do, however, vary up and down, just as acreage figures, prices, etc., will do, and may settle at somewhere near 6 bushels for 1910. This is about 1 bushel increase since 1870, and it seems quite possible that there will be an increase of another bushel in the equal period ending with 1950. We will suppose the per capita consumption for 1950, therefore, to be 7 bushels, though it may be considerably less.

The census population figures show that, starting with an increase of nearly 12,000,000 from 1870 to 1880, the succeeding increase has been rather constantly about 1,000,000 more for each ten years than for the preceding ten years. At this rate of gain the population in 1910 should be about 90,000,000, in 1920 about 105,000,000, in 1930 about 121,000,000, in 1940 about 138,000,000, and in 1950 about 156,000,000. Allowing for a considerably higher rate of increase, however, for safer calculation, we may assume it to be 160,000,000 in 1950.

At the rate of 7 bushels per capita this population would require 1,120,000,000 bushels of wheat. This amount taken from the preceding estimate of production for that year would leave a surplus of 500,000,000 bushels. Some predictions of our future population have placed it much higher for 1950 than 160,000,000, one putting it as high as 200,000,000. Supposing this last to be correct, at 7 bushels per capita consumption this population would require 1,400,000,000 bushels, leaving still a 200,000,000 bushel surplus.

WORLD PRODUCTION, RESERVES, AND EXPORT.

With the menace of wheat famine at least far away, and with a large present average production, many will inquire why prices have been high. It is explained largely by low reserves and the amount of world production. The unusual reverse conditions of the period 1892–1896, already discussed, are explained chiefly in the same way. To make clear the further discussion of this topic, some tabulations may well be made. The following table shows the annual world production of wheat since 1890, the stock of wheat of each year on hand March 1 of the following year since 1890, or rather the percentage it is of the entire crop, and our wheat export since 1890. The export set down for each year really begins July 1 of that year and includes both wheat and wheat flour.

Crop year.	Percentage of crop on farms March 1 of following year.	United States export.	World production.	Crop year.	Percentage of crop on farms March 1 of following year.	United States export.	World production.
	Per cent.	*Bushels.*	*Bushels.*		*Per cent.*	*Bushels.*	*Bushels.*
1890	28.2	106,181,316	......	1900	24.5	215,990,073	2,640,751,000
1891	27.9	225,665,811	2,369,746,000	1901	23.2	234,772,516	2,945,275,000
1892	26.3	191,912,635	2,414,414,000	1902	24.5	202,905,598	3,146,517,000
1893	29.6	164,283,129	2,426,731,000	1903	28.0	120,727,613	3,230,580,000
1894	16.3	144,812,718	2,590,121,000	1904	20.0	44,112,910	3,163,542,000
1895	29.0	126,443,968	2,593,312,000	1905	22.9	97,609,007	3,330,481,000
1896	20.6	145,124,972	2,506,320,000	1906	28.3	146,700,425	3,432,931,000
1897	22.9	217,306,005	2,233,637,000	1907	23.8	163,043,669	3,145,101,000
1898	29.3	222,618,420	2,921,045,000	1908	21.6	...	3,181,115,000
1899	28.0	186,096,762	2,725,407,000				

It is seen that there is a natural preparation for low prices and low acreages in 1892–1896. There is a considerable surplus of wheat all along, shown by the very large proportion of each crop yet on hand March 1 of the following year, the average percentage being about 28.5 per cent, or almost one-third, up to 1893. During the same time world production was good, allowing little relief through export, though the export was fairly good, particularly that of the large crop of 1891. The 1893 crop was unusually low, and by March 1, 1895, the reserve amounted to less than one-sixth. Probably through a reacting influence of the extremely low price of 1894 the reserve increased again temporarily for 1895, then from 1897 permanently decreased, with very few exceptions. The wheat overflow was checked by persistent low acreages, a very small world production occurred in 1897, prices went up, and acreage increased again. A temporary depression for two years followed the very large crop of 1898, the world crop that year also being large, reaching almost 3,000,000,000 bushels. The price fell from 81 cents to 58 cents and March 1 reserves increased. This depression continued to be felt until 1902, with the largest crop of our history occurring in 1901 and world crops increasing. Another temporary depression occurred in 1906, when we had our second largest crop and the largest world crop in history, the exports of the two preceding years having been very small. The price fell from 75 cents to 67 cents; then renewed activity began. The crops of 1907 and 1908 were only moderate, the export rose to 163,000,000 bushels in 1907, world crops of 1907 and 1908 fell considerably, and accordingly prices advanced again to 87 cents in 1907 and then to 93 cents in 1908.

PRODUCTION IN OTHER COUNTRIES.

The necessity of considering world production in calculating the trend of acreage and prices has been shown. It acts as a balance in finally bringing local extreme conditions approximately to the same level. While it does not affect our potential wheat area, a large world production puts a check upon export, and a small world production stimulates an increase in our acreage through better prices. The possible future wheat acreage of the world, also, will indicate whether we may continue to expect very much longer an occasional surplus in the world's crop.

The three principal regions upon which the world depends at present to supply the needs of other countries are (1) the plains of North America; (2) the "Black Earth" of east and south Russia, Roumania, and Hungary, and including a large indefinite area in Siberia, and (3) Argentina.

Space does not permit a detailed discussion of the probable increase in production to be expected from the countries comprised in these regions. The two provinces of Canada of any considerable importance in producing a surplus are Saskatchewan and Alberta. From a rough calculation based upon the available farm area as reported by the provincial governments we may estimate the increase in wheat production of these provinces, together with Manitoba, to be at least 400,000,000 bushels by 1950.[a] Similar calculations will show that Russia (in Europe) should increase her production at least 600,000,000 bushels and Argentina at least 300,000,000 bushels. Outside the United States, therefore, the chief exporting countries of the world should furnish a total increase in production by 1950 of 1,300,000,000 bushels. Add to this the probable increase of about 900,000,000 bushels in our own production, and the total increase for the chief exporting countries becomes 2,200,000,000 bushels.

On the basis of increase of production heretofore compared with increase in population, and considering the increase in substitute foods that is sure to occur, the world is likely to require, we may suppose, about 5,500,000,000 bushels of wheat by 1950, an increase of 2,000,000,000 over present production. The above estimated total increase more than satisfies this requirement. This increase also leaves out the numerous smaller increases that will surely occur in other countries, such as Hungary, Austria, South Africa, etc., and the possible resources of the vast agriculturally unknown regions in Siberia, Brazil, and the central plateau of Africa.

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[a] Anyone who has been "on the ground," as the writer has, during the past summer and seen the tremendous recent development in these provinces can well believe that this production is not only possible but probable, with a sufficient incentive in wheat demand.

VEGETABLE SEED GROWING AS A BUSINESS.

By William W. Tracy, Sr.,

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INTRODUCTION.

The development in the United States of the art and industry of seed growing has all come within the past century, but its growth since about the time when the United States Department of Agriculture was organized as a separate branch of the Government has been so rapid that seed growing as a distinct industry is now well worthy of the attention of all interested in American agriculture. Previous to about 1862 there was comparatively little trade in garden seeds, and still less in farm seeds in this country. Sales were practically limited to supplies for new farms and the planting of town gardens, and even the majority of town gardeners endeavored to save from year to year what seed they expected to need for their own planting. There were then no great truck farms, each using vegetable seeds by the hundreds of pounds, such as are now very common.

GROWTH OF THE BUSINESS.

One indication of the amount of business done in seed growing is the number of people engaged in it. Records of only about 45 firms that were in business in this country as distinctly seed merchants previous to 1862 can be found, while a list of American seedsmen published in 1908 includes the names of over 800 American firms whose sole business is the growing and handling of seeds, with more than 650 other firms making seeds an important part of their business.

There has also been a great increase in the quantity of seed handled by single firms. In 1820 the fact that he had just received from England 300 bushels of garden peas and over 400 pounds of onion seed was considered by a Philadelphia seed merchant as justifying his advertising that "having received this ample supply," he was "prepared to fill all orders." In 1907 one of our large seed merchants thought it best to contract for the growing of over 120,000 pounds of onion seed and more than 150,000 bushels of garden peas to meet the expected demands of the ensuing season, and his sales showed

that he had acted wisely. A single firm of American seedsmen uses for the storing and handling of its stock of garden seeds buildings having an aggregate floor surface of nearly 700,000 square feet, an area equal to more than 16 acres.

Previous to about 1850 the greater part of the garden seed used in this country, with possibly the exception of a few species, such as sweet corn and melon, which do exceptionally well here, was imported, but the art of growing seed of the best quality at the least cost of labor is now so well developed in America that we are able to grow seeds of many species of better quality and actually at less cost than they can be produced in Europe, even by the employment of their experienced labor at 40 to 60 cents a day, against the $1.50 to $2 a day which is paid here, and we now export no inconsiderable quantities of lettuce seed and that of such other species or varieties as do exceptionally well in some sections of this country. There are some species, however, which can still be grown to better advantage in Europe, though, thanks to the great diversity of climatic and soil conditions and to American energy and inventive skill, the number of these is constantly decreasing. With the exception of a greater dependence on hand labor and a less common use of machinery, European methods of growing and handling seeds do not differ materially from those of this country, and therefore it will not be necessary to specifically refer to them again in this article.

EARLY METHODS OF SEED GROWING.

In early times most of the garden seed produced in America was grown by the seed merchants themselves, either on their own farms or on lands in their immediate vicinity and under their own personal supervision, while seed growing as a business distinct from that of the seed merchant was unknown. As buyers learned of the superior value, at least for use in this country, of American-grown seed, the seed merchant's business increased until he was no longer able personally to attend to the seed growing on his neighbors' farms or even on his own. The supervision of this work was therefore handed over to some of the merchant's employees or to one of the most capable of the neighboring farmers, who looked after the growing and handling of both his own and his neighbors' seed crops, at first under the direction and control of the seedsman and acting as his agent, and then independently on his own account. Thus the business of the seed grower as distinct from that of the seed merchant was established. In many cases there was simply the organization within the original firm of a seed-growing department. Now the growing of seeds and their marketing are quite as distinct as are the manufacture and the sale of other merchandise.

EXTENT OF THE INDUSTRY.

It is practically impossible to give an accurate statement of the area in the United States which is annually devoted to raising garden seeds, or even to make a reliable estimate of the total acreage. Even on farms where the chief money crop is garden seed, only a portion (often but a small portion) of the whole farm is in a seed crop any single year, the remainder being occupied with ordinary farm crops in order to maintain a profitable crop rotation. The major portion of American-grown small seeds, like those of onion and lettuce, is the product of large farms located in California, though many thousands of pounds of such seeds are still grown in the Eastern States. One who is very familiar with seed growing on the Pacific coast estimates that the total acreage of vegetable seed annually planted in California is not far from 6,000 acres; others have placed the area as high as 10,000 acres, but for one cause or another no usable seed is secured from many of the fields. Plate XV, figures 1 and 2, shows the harvesting of a crop of onion seed on a large California seed farm. Practically all American-grown cabbage seed is produced on from 600 to 800 acres located on eastern Long Island and in the Puget Sound region.

Vine crops, such as cucumbers, melons, and squashes, are grown for the seed crop in all parts of the United States, some being still grown in the Northeastern States and others in Florida, with still others in California; but the great bulk of the supply of vine seeds comes from Michigan and the central Western States. It is impossible to give more than an estimate of the total acreage actually planted for the seed crop. Often a large portion of the fruit in a field planted with the expectation of marketing it as fruit is used for seed, and other crops which were planted for seed are marketed as fruit. Probably a total of 60,000 to 80,000 acres of vine crops is annually planted with the expectation that more or less of the crop will be marketed as seed.

Seed peas, beans, and sweet corn come mostly from the country between central Connecticut and western Nebraska and north of the southern boundaries of those States. Plate XV, figure 3, shows a wire crib such as is used on the dry uplands of Nebraska for curing and storing seed of sweet corn. There is even greater uncertainty of yield with these crops than with vine seed, and the area planted varies greatly in different years, but it is probably no exaggeration to state that it ranges from 100,000 to 200,000 acres, though if a full crop were secured from even as much as 90 per cent of the smaller area mentioned it would be much more than a full year's supply.

IMPORTANCE OF QUALITY IN SEEDS.

Fifty years ago there was little general appreciation, even among experienced gardeners, of the importance of the quality of the seed used (provided it would only grow) as a factor in determining the real profit in growing a crop. To-day no one appreciates this more fully than our best gardeners. In a recent publication a gardener is mentioned who sold muskmelon seed which he had saved and then paid five times as much as he received for his own crop for seed of the same variety which he had reason to believe was better than his own selection, the results obtained showing that he had profited by the exchange.

ELEMENTS OF VALUE IN GARDEN SEEDS.

The elements of value in garden seeds are in some respects the same as in the case of other produce, though often of different relative importance, and the market value of seeds is often affected by qualities and conditions which are peculiar to them, so that a consideration of these conditions and the consequent business methods of seed merchants is an essential part of a full discussion of the art and practice of seed growing.

Appearance.—An attractive appearance of the sample as regards cleanliness, size, plumpness, and color of grain is a desirable quality and one easily recognized, but it is often misleading as to real value. For instance, in the case of Red Valentine beans, bright-red, plump, symmetrical seed is usually inferior in varietal character to that which is dull red in color and shrunken, twisted, and unsymmetrical in shape.

Vitality.—That every grain under favorable conditions shall not only germinate but develop into a healthy plant is regarded by many, particularly by those of little horticultural experience, as the most important of all qualities. As regards a single grain, viability is essential to its value as seed; but of two samples, in one of which 60 to 75 per cent of the grains will develop into plants typical of the sort, the remainder not germinating at all, and in the other, though every seed will grow, only 10 or 20 per cent will give good plants of the sort, the other 80 to 90 per cent developing into a medley of different forms and qualities, the first lot, though only 60 to 75 per cent viable, is in the majority of cases decidedly the most satisfactory and valuable. The vigor and percentage of viability can rarely be told by even the most careful inspection of a sample, but is readily ascertained by germination tests, which, however, it requires some days to complete.

Purity and evenness.—Purity and evenness of varietal character are the most important factors in determining the real value of seed. A seed is simply an embryo plant packed for transportation and carries within itself the immutable potentiality and limitation

of development of the plant into which it may grow. Man by control of conditions of growth may secure more or less perfect development of these potentialities, but he can not add to or change them. They are made up of a balanced sum of the different tendencies which the embryo plant has inherited in varying strength from each of its ancestors back for an indefinite number of generations. The relative strength of these different influences and the resultant varietal character of the plant into which the seed will develop can not be learned from the appearance of the seed itself or even with certainty from that of the producing plant. It can be known only through an accurate and intimate knowledge of the varietal character of the stock from which the seed was grown or through the actual growing of a sample of it to full maturity. The term "sample" is commonly used by seed dealers as referring to the appearance and viability of a lot of seed, and the term "stock" as referring to its purity and evenness of varietal character. Plate XVI, figure 2, shows such a test of varietal character of different lots of seed.

Relative supply and demand.—The commercial value of seeds is dependent, even to a greater degree than is the case with most merchandise, upon relative temporary supply and demand. A shortage can not usually be met with a fresh supply until the next season, and the cost of the seed of most vegetables is so small a proportion of the total cost of the crop that planters are willing, if necessary, to pay advanced prices, particularly if they think that the shortage of seed will result in the reduction of acreage planted and a consequent better demand and price for the crop.

On the other hand, most seeds are of comparatively little value for any other purpose than planting, and while they will often retain their vitality and consequent usefulness as seed for several years the trouble and loss in storing them are so great as to be avoided if possible, and seedsmen are often willing to sell any surplus over the season's demands at very low prices. The production of even a small quantity more than the trade calls for thus becomes a menace to ruling prices and reduces the selling value of the entire stock on hand.

COMMERCIAL PRACTICE IN THE HANDLING OF VEGETABLE SEED.

The conditions just mentioned result in methods and practices in the seed trade which are somewhat different from those common with most lines of merchandise. A wise seed merchant will be unwilling to risk his reputation for handling pure and true stocks by purchasing by sample, no matter how good it may seem to be, unless he has some knowledge of the stock from which the seed was grown, and in most cases he will insist upon using only such seed as was subject while growing to his inspection and approval or which he

knows was grown from approved stock. He will discourage the speculative growing of seed for sale by sample, because of the liability of such crops to disturb the balance between supply and demand, an overproduction often proving more disastrous than a scarcity. We have known of seedsmen buying such "pirate" crops simply to keep them out of the market. Early in the season the wise seed merchant will decide on the quantity of seed of each variety he can reasonably hope to dispose of the following year, and then contract with seed growers or directly with farmers for the planting of a sufficient area to produce that quantity. Contracts with professional seed growers usually provide for the planting of such an area as will with an average yield produce the quantity of seed contracted for and the delivery on the contract of such proportion of the entire yield of the grower's planting of that variety as each contract bears to the sum of all of his contracts for the sort.

The seed grower, however, sometimes becomes a speculator, and because of purchases or of the carrying over of a portion of previous crops it may happen that while he is unable to deliver more than 50 per cent of the quantity he has contracted for, the yield of his season's crop having been light, he can still honorably offer seed of the same variety at an advanced price; or in a year of exceptionally fine crops he may be able, after making delivery in full on all his contracts, to offer surplus seed from the same fields at greatly reduced prices rather than carry it over to another season.

CONTRACTING WITH FARMERS.

Generally, the professional seed grower plants his area of vegetables like cabbage, onions, and beets, which require parts of two seasons to grow a crop of seed, or like lettuce and radish, which require special machinery for harvesting or fitting the seed for market, on lands under his immediate control, where they are cultivated and harvested under his own supervision; but annual crops like sweet corn, peas, and beans, which can be well grown, harvested, and cleaned by ordinary farm methods and the use of common farm machinery, are often sublet to farmers, the grower supplying the necessary seed and agreeing to pay a specified price for all the seed in excess of the quantity furnished for planting which the farmer may be able to produce on a given area and to deliver in such condition as to vitality and cleanliness that it is fit for seedsmen's use or can be made so without an unreasonable amount of recleaning. The farmer, however, is regarded as a simple cultivator, who is not held responsible for the quality of the seed except that it shall be grown from the stock seed furnished, be properly cultivated, and harvested so as to secure a good sample, and shall not be contaminated by other crops while it is growing or being harvested and cleaned.

WHY FARMERS OFTEN CONTRACT TO GROW SEED AT VERY LOW PRICES.

Seedsmen and growers are often able to place seed contracts with farmers at much lower rates than it would cost them, even with the use of special machinery, to grow the crop themselves. That they are able to do so is due to the following conditions:

(1) Though it is true that certain local conditions of soil and climate are essential to the profitable growing of some species of seed, yet such soils are so widely distributed and their total area so much greater than is necessary for the production of all the seed needed that their possession and use for seed by no means insures a profitable crop.

(2) The growing of seed which is to go to some widely advertised seed firm seems to many farmers more attractive than the growing of grain for sale in the open market, and these men are so numerous and so eager for a contract that by competition they lessen the price the seed grower has to pay for growing his crops.

(3) A seed crop which can not be readily sold in the open market or used by driblets, but must be delivered at a specified time and place, is often a desirable one on farms worked on share rentals.

(4) There are some vegetables, like melons, which will do particularly well and be enormously productive on new lands and which, because of little need of cultivation or of the necessity of fighting insects and diseases, can be grown there very cheaply, but because of lack of transportation facilities the heavy, bulky fruit can not be profitably marketed, while the more concentrated and lighter seed crop can be profitably grown and delivered at a price much less than the cost of production on older lands. Plate XVI, figure 1, shows a crop of squash grown for seed on a farm in western Kansas which was so far from any market that the heavy fruit could not be profitably shipped, while the lighter seed crop gave very satisfactory returns at a price lower than the cost of production on older lands.

(5) Very often a seed crop which can be planted late in the season and with but little special preparation of the soil is a most convenient one to take the place of one of wheat or other grains which was badly winterkilled. This is often especially true of a seed crop of peas and beans, because the seedsman commonly advances the seed, which makes up from 10 to 25 per cent of the cost of the crop.

Only a small proportion of the farmers who now grow seed crops do so because of special facilities or knowledge, or even because they have found them more profitable than general farming, but the majority (particularly in the case of peas and beans) do so rather through practical necessity, because of inability to secure the seed for planting these crops in any other way.

THE FARMER WHO GROWS SEED CROPS NOT CONSIDERED IN THE "TRADE."

Seed merchants, and even seed growers, refuse to recognize the farmer who grows their seed crops as in any sense a member of the "trade," but regard him simply as a cultivator with no technical knowledge of the variety of seed he grows and no greater interest in a seed crop than in one of corn or grain. It is not surprising, therefore, that comparatively few farmers continue to grow seed crops for as many as a dozen consecutive years, and seed growers are frequently obliged to select a new location in order to secure a fresh lot of farmers to undertake to grow seed crops. It is not strange that under such conditions the growing of seed should not fall into the hands of the best farmers, nor be sufficiently popular to secure the best care from those who do undertake it.

SEED FROM CANNERIES.

Another source of supply and one that is a factor in lowering the price paid the farmer for growing seed is the use for seed of the "get-away" crops of canners and truckers. Canners endeavor to arrange for the planting of the crops they are to use on such dates that they will be able to care for each one of them when it is in prime condition, but from various causes, often because of weather conditions, they are sometimes unable to handle some of their crops at the proper time, and they become too mature for canning. Often the only practically available use for such "get-away" crops is as seed, and when they are sold as such, being in the nature of salvage, the canners are glad to dispose of them at any price they can obtain. Canners also often find it profitable to clean for sale to seedsmen the seeds from the waste of such crops as tomatoes and squash, which were grown and used for canning.

TRUCKERS' CROPS.

Occasionally truckers' crops which could not be sold in the green state at prices which would equal the cost of gathering and marketing are allowed to ripen and are sold as seed. While the quality of such seed is not equal to that grown from selected and carefully bred stock seed, it is often as good as that of a seed crop, grown as many are, from general stock. It often happens that such crops grown by canners or truckers and those grown for the seed merchant are the products of the same or equally good lots of seed, in which case one is as good for seed as the other, provided equal care has been taken to prevent mixture with fruit of different varieties or with that which was grown from different and inferior stock. Seedsmen do not advertise that they make use of such crops; some of them deny that they ever do, but many cases are known where carloads of seed known to be the product of such "get-away" crops were sold to some of our most reputable seedsmen.

FIG. 1.—GATHERING ONION SEED IN CALIFORNIA.

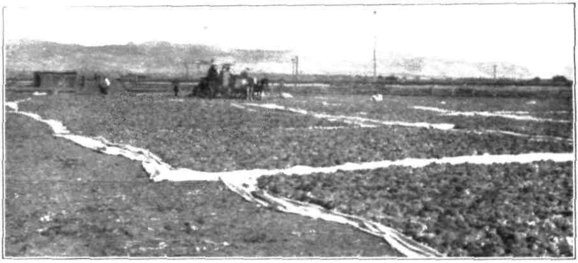

FIG. 2.—ONION SEED SPREAD OUT TO DRY, CALIFORNIA.

FIG. 3.—WOVEN-WIRE CRIBS USED IN NEBRASKA FOR CURING SWEET CORN SEED.

SEED-GROWING IN CALIFORNIA AND NEBRASKA.

FIG. 1.—HUBBARD SQUASH GROWN FOR SEED IN WESTERN KANSAS.

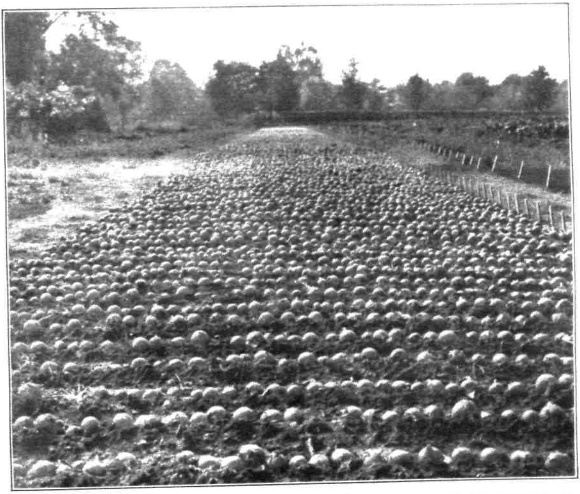

FIG. 2.—TRIAL PLATS USED IN PENNSYLVANIA FOR DETERMINING THE RELATIVE VALUE OF DIFFERENT VARIETIES AND STOCKS OF ONIONS.

SEED-GROWING IN KANSAS AND PENNSYLVANIA.

NEED FOR IMPROVEMENT IN PRESENT PRACTICES.

It is evident that the present practice of growing and handling seeds is by no means ideal or such as to give the greatest possible uniformity of varietal character. In the case of a majority of the vegetable cultures[a] in America, if all or even 90 per cent of the plants were as nearly alike in varietal type as the 20 per cent which were the most alike, the profit from these cultures would be greatly increased; often actually doubled. On the other hand, the growing of vegetable seed under present conditions is not particularly profitable or satisfactory to the farmer. Is there any possibility of betterment? We think so.

Seed planters are coming to realize more fully the importance of the use of better seed and the folly of being so largely influenced by low prices and a persuasive salesman in buying, while seedsmen and professional growers are learning that wisdom and care in the breeding and growing of the seeds they offer is quite as important as shrewdness in buying and skillful handling and selling, and that seeds of the best quality can not be secured without the active, intelligent cooperation of the producing farmer.

SUGGESTIONS FOR POSSIBLE IMPROVEMENT.

The seed grower should come into closer touch with the producing farmer and should make a greater effort to place his contracts not only with good cultivators who are most favorably situated both as to climate and soil for growing and facilities for the handling of some particular seed crop, but with those who are likely to continue to grow seed, become interested in the varietal character of the sorts they grow, and through a better knowledge of their cultural requirements secure greater uniformity and stability of product. It is true that this necessitates giving the farmer a better place "in the game" and paying him higher prices for growing the seed, but this is more than offset, even financially, by the elimination of careless and incompetent farmers who are likely to fail to deliver the expected crop and through whose negligence carefully selected stock seed is often lost. The advantages from the building up of a clientage of experienced and careful farmers who would not only deliver better seed, but in more uniform quantities, so as to lessen the liability to the alternating periods of scarcity and surplus which are now so

[a] The word "culture" is used here in the way it is used in Europe to signify a planting or separate lot. If a 5-acre field or a greenhouse is planted wholly with Grand Rapids lettuce, all sowed or set at the same time, either is a culture of Grand Rapids lettuce; but if the field is planted with two different varieties of lettuce, or the house with different lots of Grand Rapids lettuce set at different times, each different lot is a culture of that variety.

common and unsatisfactory, would more than counterbalance the additional price paid. Again, the necessity and expense of constantly hunting up new growing centers and training new farmers would be lessened, though possibly not entirely obviated, since this is often necessitated by the local development of special diseases or insect pests as a result of the large area devoted to some particular crop and of permitting it to come to full maturity of seed before harvesting.

One of the most important factors in the growing of a stock of seed which will develop into plants of uniform varietal character is to form a very clear conception of precisely the varietal form wanted. It is very important that this be clearly defined and written out and that such written description be frequently referred to in order to avoid indefiniteness and change in the type selected, which is very often the cause of want of uniformity in seed otherwise carefully grown. It is true that it is a practical impossibility to write a description which will enable a reader to recognize with certainty the varietal characteristics the writer has in mind, but the attempt to write such a description will always clarify the writer's conception of the exact type he seeks; and it is believed that a rigid adherence to exactly the same varietal character for successive generations is the *key to the production of seed which is certain to develop into plants* of that exact character.

A second factor is the growing, by methods which will vary with different species, of stock seed all of which shall not only be the product of plants of the same varietal character, but which is known to be the product of just such plants for the greatest possible number of generations. This stock seed may then be given into the hands of the farmer for the production of seed for market.

The seedsman and the farmer should come to a very clear understanding as to the qualities most desirable in each variety, and these should be established by a sample, a photograph, and a full varietal description. *An intelligent and interested farmer, particularly if he* confines his seed crop to a single variety of a species, is in a better position to select stock seed and can do it better and cheaper than it would be possible for a seedsman to grow it, and he should be advised as to the exact varietal character wanted and instructed to select a sufficiency of the best possible stock for his own crops, if nothing more.

WHAT THE FARMER SHOULD STUDY.

There is a possibility of a great improvement in the methods and practice of the farmer. He should make a careful study not only of the particular crop, but of the variety best adapted to his conditions of soil and climate and of the cultural methods which will give him the greatest certainty of a crop of seed, and also of the methods of

harvesting and cleaning it which will secure the greatest possible return of seed which shall be bright, clean, highly vital, and fit for seedsmen's use. Many cases are known where of two crops of the same seed grown on adjacent farms and which up to the time of harvest were equally promising, one gave a good return of seed which was clean, highly vital, and satisfactory to both farmer and seedsman, while the other crop, solely because of careless handling, was so discolored and lacking in vitality that it was unfit and worthless for seedsmen's use, though it might bring as much as the other if both were sold as grain.

PECULIARITIES OF A CONTRACT FOR GROWING VEGETABLE SEEDS.

A contract for growing seed differs quite materially from one for the manufacture or delivery of most merchandise in that the practical possibility of its fulfillment is very dependent upon weather and other conditions which man is powerless to predict or control. The *most that such a contract can equitably provide for is that an honest* and well-directed effort be made to grow and deliver the quantity of seed contracted for. The price specified in the contract should be based upon the actual cost of the production and delivery of the seed *of the particular variety named under normal and average climatic* conditions. A price which would be equitable under such conditions might prove entirely too low to meet the actual cost of the growing, harvesting, and delivery of the crop in an exceptionally unfavorable season.

Under such circumstances the farmer sometimes fails to appreciate the importance of the agreement he has entered into and either fails to plant the area under contract, plows it up and plants some more promising crop, or neglects to properly cultivate and harvest the meager crop which it is possible to secure. In other instances when because of a general failure of the crop of that particular sort seed is exceptionally scarce and valuable and some "pirate" seedsman offers double the contract price for the crop the farmer lets him have it, claiming that he is justified in doing so because his contract was unfair.

On the other hand, it often happens that when there is an unfavorable season and the farmer has done his best to get and deliver what seed he could, although both he and the contracting seedsman knew that because of exceptional weather conditions it would cost him more than the contract price to do so, the farmer has received the bare contract price, though knowing that he could readily sell the crop for double the price he received.

In growing garden seed on contract, permanently satisfactory dealing will depend upon all settlements being made upon an equitable rather than upon a simple legal basis, and a reputation for fair and equitable dealing is most important to all concerned.

CONCLUSION.

This discussion has been limited to a consideration of the common practice in the growing of garden seed, with little direct reference to the possible growth of the industry or the openings it affords for the development of a profitable business. When one compares the prices paid at the corner store for small packages of vegetable seeds with the actual cost of growing the seed, seed growing would seem to be enormously profitable; but such prices are only obtainable for small quantities and in the course of a retail trade, which the farmer is seldom able to command or satisfactorily supply. The trade conditions certainly would not justify an inexperienced farmer in planting vegetables of any kind for a crop of seed with the expectation of being able to sell the seed at prices which would make the crop as profitable or as satisfactory as one of grain. It is true he might secure a crop in a season when, because of a general shortage, he could sell it at a price which would make it profitable, but it is more probable that he could not sell it at all, or only at less than it cost. Neither would it generally be wise for a farmer to attempt to establish a connection with some seed house and devote his whole farm to seed growing. The wiser course when one has good reason to believe that conditions under his control are such that he can profitably grow seed would be for him to get into communication with some seed merchant or seed grower and secure a contract for the growing of a limited acreage. If he found that his conditions enabled him to produce certain vegetable seeds of such superior quality that they would command remunerative prices, he might make vegetable-seed growing a very profitable and satisfactory part of his regular farm operations.

INFORMATION IN REGARD TO FABRICATED WIRE FENCES AND HINTS TO PURCHASERS.

By Allerton S. Cushman,

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INTRODUCTION.

For a number of years the Office of Public Roads has been making a study of the various problems presented by the corrosion and rusting of iron and steel, particularly in relation to road culverts and wire fencing. So many inquiries for information in regard to what constitutes the best type of fabricated wire fence reach the Office that it has been thought best to prepare this paper for the benefit of farmers and agriculturists generally.

THE DETERIORATION OF WIRE FENCES.

To begin with, we may accept the following statements as facts supported by the testimony of a large number of consumers as well as by the results of scientific investigation and observation:

(*a*) A very large proportion of the wire fencing manufactured and sold in the United States rusts much more quickly than it should. In many instances fencing which might reasonably be expected to last for ten or fifteen years will begin to rust and decay rapidly in less than two or three. Near the seashore and also in the neighborhood of large cities and manufacturing plants which pollute the atmosphere with sulphurous gases, wire fences will naturally rust much more quickly than under average rural conditions. Even under strictly rural conditions there has been noted a great difference in the life of wire, owing to prevailing climatic conditions, such as the general strength and direction of the wind and the amount of abrasive dust which is carried. After making all due allowances for these variations, it is none the less true that under perfectly normal rural surroundings there is still sufficient reason for complaint in many cases on account of rapid disintegration of wire fences.

(*b*) It is often claimed that the old wire manufactured twenty to thirty years ago was more resistant to corrosion than that which is

now produced. While this has been shown to be true in many specific cases, the observation has no bearing on the modern fence problem, because trade conditions, metallurgical practice, and the demand of the consumer have brought about conditions entirely different from those which prevailed years ago. No puddled-iron wire is now made in the United States or in any other country for the manufacture of woven or fabricated wire fences. As under the circumstances it would be impracticable and impossible to return to iron wire as distinguished from steel, it is useless to waste time in the discussion of this phase of the subject.

The rapidity with which a given wire fence will rust under normal conditions depends upon a number of factors, among which the following should be noted:

(1) The character and quality of the steel from which the fence is constructed.

(2) The character and quality of zinc, or spelter, used in the galvanizing process.

(3) The integrity or evenness of distribution of the zinc coating.

(4) The weight of zinc carried by the wire.

(5) The weight or gauge of the wire used in the fencing.

THE MANUFACTURER'S PROBLEMS.

The first three of these factors furnish problems for the manufacturer alone. The tendency now among the leading manufacturers is to pay more and more attention to the control of the impurities in their steels and a decided improvement has been made in this respect within the last few years. There is still room for further improvement and, on account of the fact that the manufacturers are now alive to the necessity of turning out a better product, there is every reason to believe that a better quality of steel will be used hereafter in the manufacture of fencing. The problem involving the character and quality of the zinc, or spelter, used in the galvanizing processes is not yet solved, although some improvements have been brought about. In regard to the integrity or evenness of the distribution of the zinc coating, great progress has been made within the last few years and it is now possible with care to produce a more even and heavier coating than has previously been used.

PROBLEMS OF THE MIDDLEMAN AND THE CONSUMER.

Over the last two factors named above, the consumer and the middleman exercise as much influence as the manufacturer, if not more, and therefore can not evade their share of responsibility for the rapid rusting of wire fencing. It appears to be a technical impossibility for the manufacturer to make a light-gauge wire carry as much of the

protective zinc coating as a wire of heavier gauge, and yet the demand of the consumer for cheap light-weight fencing has caused a growing tendency to supply lighter and lighter gauges. It is to the interest of the manufacturer, as well as the middleman, to supply the demand which will insure the highest percentage of sales. The consuming public, in demanding lightness and apparent cheapness, is thus responsible for two principal factors which lead to the rapid rusting and consequent destruction of fencing.

The leading manufacturers catalogue and advertise wire fencing of many different weights and designs and as a rule advocate the use of heavier wire where durability is desired. The middleman, with limited warehousing facilities, can not carry in stock all the different types provided by the manufacturer with whom he deals, and so he usually carries only that kind and weight which his opinion and experience tell him is the best seller in his neighborhood. Thus it is often to the interest of the middleman to lead and influence the demand in a locality. A purchaser who goes into a store to buy wire makes his selection, in nine cases out of ten, from the stock on hand, regardless of the possibility that none of it is well adapted for his especial needs or conditions. For this reason the middleman must accept his share of the responsibility for the increased tendency to corrosion of modern fence wire.

The writer believes that a wire fence should never contain wires of lighter gauge than No. 9 or No. 10, except in the fine-meshed poultry and rabbit fencing, which will later on be spoken of separately.

Careful observation of a large number of fences in different parts of the country shows that the vertical or stay wires in a fabricated fence almost always begin to rust before the line or bar wires. This is due in part to the fact that the tie wires are usually of light gauge and consequently carry a lighter zinc coating, and in part to the fact that the rainwater running down the vertical wires makes a stronger attack on the zinc. Therefore, if the object is to purchase a fence which will last the longest, instead of one whose first cost is the lowest, it is important to select a type in which the stays are as large and as heavy as the line wires.

HOW TO PRACTICE REAL ECONOMY.

Many consumers will be willing to pay almost twice as much for a good fence if they can feel assured that it will last three or four times as long without rusting. On the other hand, many consumers will object, because they think the first cost is an item of such importance that they can not afford to take their choice. This is in most cases a mistaken idea. The kind or type of fence that is selected should depend upon the use to which it is to be put. A hog-tight fence needs

a certain number of strong wires near the ground, while a cattle fence calls for a different design and must be horse high. In many cases a design of all 9-gauge wires can be selected which will answer every purpose, and cost no more, or even less, than the lighter-gauge fences ordinarily used. A general-purpose farm fence, hog tight and horse high, 58 inches high and containing 12 wires, should cost about 40 cents per rod if made up principally of 11-gauge bars and 12-gauge stays. The same fence, made of all 9-gauge wires, should cost about 60 cents per rod. It is probable that the heavier type would outlast the lighter by many years, but the initial cost is high. Now, in many such cases the consumer could select a fence that would answer every purpose—say one with 8 wires, 45 inches high, made up of all 9-gauge wires—costing about 40 cents per rod. If a fence of this type is not high enough for heavy stock, a single strand of barbed or smooth wire run along the posts about 6 to 10 inches above the top will add to its efficiency with a small addition to the cost. In other cases,

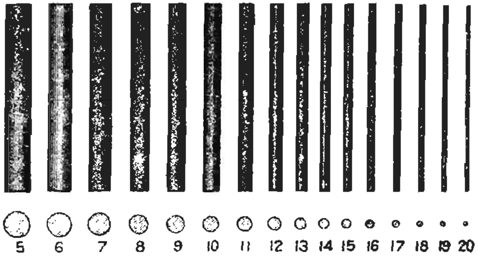


FIG. 6.—Sizes of plain wire.

where it is not necessary to fence hog tight, the fabricated wire can be set on the posts with a clearance at the ground, thus increasing its height. A systematic inspection in various parts of the country has shown numberless cases of fences made of 12 and 14 gauge wire, which in less than three years were rusting badly, to the great disgust of the owners. In many cases these were 12-wire fences, 58 inches high, or 10-wire fences, 52 inches high, although they were performing service for which a 6-wire fence, 35 inches high, with perhaps a single additional wire, would have answered.

Badly selected, broken-down, and rusty fences give a shabby appearance to any country and too often represent a mistaken idea of economy. If it is necessary for a purchaser to economize on first cost, it should be done by cutting out unnecessary bars and stays and not by reducing the gauge of the wires.

SIZES OF WIRE AND CHARACTER OF STEEL.

The approximate diameters of the different gauges are shown in figure 6, and the number of feet to the pound of various sizes of wire to which reference has been made are given below:

Sizes and weights of plain wire.

Gauge.	Diameter.	Weight of wire per mile.	Length of wire per pound.	Gauge.	Diameter.	Weight of wire per mile.	Length of wire per pound.
	Inches.	*Pounds.*	*Feet.*		*Inches.*	*Pounds.*	*Feet.*
1	....	1,128	4.68	11	1/8	204	25.82
2	....	970	5.44	12	7/64	150	33.69
3	....	836	6.31	13	....	117	44.78
4	....	715	7.38	14	5/64	90	58.58
5	....	603	8.75	15	....	73	72.32
6	....	519	10.17	16	1/16	55	95.98
7	3/16	441	11.97	17	....	41	128.6
8	....	369	14.29	18	....	31.77	166.2
9	5/32	309	17.05	19	....	23.67	223
10	9/64	256	20.57	20	....	17	309.6

There is, of course, a practical limit to the increase of size in the wires and, except for certain special purposes, the use of heavier wires than No. 9 gauge is not recommended. Larger sizes increase the weight unnecessarily and the wires are so stiff that it is difficult for the user to handle and stretch the fabric. No. 9 gauge wire is strong enough for every practical purpose and can be made of low-carbon or so-called "mild" steel, which is much easier for a farmer to handle and fasten than high-carbon or spring steel. High-carbon steel is used for strength in lighter gauge wires and an impression is prevalent that high-carbon steel is more resistant to corrosion than mild steel. This is not true, and in the opinion of the writer low-carbon stock is a better all-around material for fence wire than high-carbon or spring steel.

A BAD COMBINATION.

In some cases where hard steel has been assembled in the same structure with mild steel the latter has been seen to corrode more rapidly than the former. The detailed scientific explanation and proofs of this statement can not be entered into here, but it is a fact that the contact of two different types of steel in a fabric or structure will result in the protection of one at the expense of the other. In other words, one of the two types of metal will rust much faster than it would have done if assembled in a structure by itself. This is due to the difference of electric potential that is set up at the junctures of metals of different type, a condition which inevitably leads to rapid corrosion and which should be carefully avoided. As

soon as all the manufacturers appreciate the truth of this statement one of the many factors which tend to promote accelerated rusting will be removed.

ADVANTAGES OF USING HEAVIER WIRE.

The general use of Nos. 9 and 10 gauge wire will be found to be of mutual advantage to both the producer and the consumer of fencing. The use of the heavier wire enables the manufacturer to work up a larger tonnage of metal without material increase in labor and other cost charges, and he may also expect to earn a better reputation for his products than he has hitherto enjoyed. The consumer will be repaid by the longer life of his fences and a higher efficiency in the objects for which the structure is designed. It is a mistaken idea to suppose that because the use of heavier wire operates to the advantage of the manufacturer, the selection of light wire must necessarily operate to the advantage of the consumer. A light fence which must soon be renewed might possibly be considered an advantage to the manufacturer, if there was only one kind of fence available or if he entirely controlled the market. But a consumer is not likely to repeat a failure with a particular brand of fence, and as the competition in the manufacture of wire is especially keen in this country, it is at once apparent that fences which rust rapidly work against the interest of all concerned.

Many wire fences are injured by trespassers and by people climbing the wire. A wire fence was not designed to be climbed, but it is evident that the heavier wire will not suffer from this cause to the same extent as the lighter gauges. A single strand of four-point barbed wire set about 6 to 8 inches above the top of the fabricated fence and on the opposite side of the post will usually obviate the difficulty.

IMPROVEMENTS IN GALVANIZING.

Within the last few years the leading manufacturers have so improved the methods of galvanizing fence wire that it is now possible to put on a heavier coating of zinc. One objection to heavy zinc coatings is that they have a tendency to crack or lift a little at the joints and bends in the fabric. This has been considered a bad feature by both producer and consumer and has resulted in a tendency to wipe the zinc coating very smooth in the galvanizing process in order to overcome the difficulty. In some cases this wiping is so successfully accomplished that almost no zinc is left. In fact, this point raises an interesting question as to whether a slight roughening at bends is not to some extent a guarantee of a heavy zinc coating. By means of standard tests a chemist can tell how much zinc is carried by galvanized wire and, if the consumer desires to go to the expense, he can have sample wires from different brands of fencing

examined and reported on before he makes his purchase. If this method is resorted to, however, conclusions should not be drawn from the result obtained on a single sample of the wires under examination. At least seven wires from each fabric should be tested before drawing conclusions. The samples should represent different strands and should be cut about 1 foot in length.

PAINTING THE FENCE.

The life of wire fencing may be prolonged by painting, as has been shown by tests carried on for many years at a number of zoological gardens in different parts of the world. It has been estimated that the ordinary farm type of fence can be painted at an expense of about 1 cent per rod. The main difficulty encountered in painting wire is in the kind of the paint. Paints which may have given good results on house or barn are not necessarily suitable for putting on wire. The writer has seen successful results obtained with the use of a basic chrome green paint. In general the advice of some person familiar with paint technology should be taken before selecting a paint suitable for galvanized wire.

POULTRY NETTING.

Some information may now be added on the subject of poultry netting. This form of wire construction naturally calls for a much lighter gauge wire than ordinary farm fencing. Poultry and rabbit fencing is furnished in a number of different designs by the manufacturers, but the kind most generally used is known as hexagon poultry netting. This is usually made in two different grades by the manufacturers. One grade is galvanized after fabricating or weaving the mesh; the other grade is made from about 20-gauge wire previously galvanized. It is safe to say that the second grade is not fit to use, and should never be purchased by anyone who desires to build a lasting structure. If first cost is a great consideration it would be wiser to make the poultry runs smaller and select the better grades of wire. It is easy to distinguish between these two grades of poultry netting, as that which is woven of wire previously galvanized will readily untwist, while in the other grade the twist will be found to be stuck together by the zinc coating.

USE OF WIRE FENCING IN SHEEP RAISING.

In concluding this brief paper it may be pointed out that the proper fencing of land is one of the most important problems of American agriculture. This is particularly true of the sheep and hog raising industries. There are probably from 50 to 60 million sheep in the United States at the present time, of which a very large proportion are range-fed and herded. There is, however, a growing tendency to undertake the raising of pastured sheep. In Australia,

where the old system of herding has been given up entirely, it is estimated that the owners obtain an increase of 10 per cent in lamb crop due to the pasturage system. Under the conditions which prevail in this country at the present time it is probable that the successful pasturage of sheep must depend principally upon efficient wire fencing. Properly designed fencing not only protects the animals from the attacks of predatory enemies, but also enables them to be transferred at frequent intervals to new land, which appears to be an absolute necessity for successful sheep raising.

The Department of Agriculture receives a large number of letters asking for information in regard to the best brands and types of fence to buy. It is evident that the Department can not give specific answers to questions of this kind, for such information would amount to an advertisement for any special brand or style recommended.

SUMMARY OF RECOMMENDATIONS.

(1) Buy the best grade of wire you can afford. If you must economize, do so in the design of your fence and not in the gauge or weight of the individual wires.

(2) If your dealer does not carry in stock the design or type of fence you think is needed, ask him to supply you with the manufacturers' catalogues. If he can not do this, write to the sales agents of the manufacturers.

(3) Insist on getting what you want; if the dealer will not or can not supply you, order elsewhere. Railroad companies and other corporations make reasonable specifications for the wire fence they require and insist on having them filled. You can do the same thing.

(4) Remember that the farm fence made of light-gauge wire, while cheaper in first cost, is often the most expensive in the end, and that the first cost can be lowered by intelligent selection of the type and design best adapted to your special needs.

(5) Remember that the manufacturers are anxious to sell fencing and will always be glad to furnish you with information.

(6) Some of the manufacturers are now ready to supply fences made out of extra heavily galvanized wire. These fences, of course, cost more than the stock types and are difficult to manufacture. For further information, you should write the manufacturers.

(7) The public demand for better fence wire, together with the cooperation between the Department of Agriculture and leading manufacturers, is gradually bringing about great improvements in the quality of wire fences. You can aid this movement by insistent demand for what you want, but you can not expect the maximum quality and rust resistance for the minimum cost.

(8) The names of the leading manufacturers of steel wire and fencing can be obtained from advertisements in trade papers or from agricultural journals; they can not under any circumstances be furnished by this Department.

METHODS OF APPLYING WATER TO CROPS.

By Samuel Fortier,
Chief of Irrigation Investigations, Office of Experiment Stations.

OPPORTUNITY FOR IMPROVEMENT IN METHODS.

Sixty years ago the practice of irrigation was new to the people of this country. In the gradual development since then many methods and devices have been tried, but comparatively few have been successful. Costly experiments in irrigation have been made, but in only a few cases have the results justified the expense.

Out of these trials and failures there have been evolved, however, certain well-established ways of doing things which under given conditions are considered superior to any other methods yet devised. The purpose of the writer in preparing this article is to present some of the features of irrigation practice which have successfully stood the test of repeated trials under widely differing conditions. It is not claimed that the methods herein described represent the highest achievement of western people in this direction. They but mark a step in a rapid development in which that which is considered best this year may be superseded by something better next year.

The agricultural wealth of that vast region lying west of the Missouri River was first made known by men who were poor in worldly goods but rich in those physical and mental endowments which go to make up the best type of citizenship. Their poverty, unfortunately, compelled them to make use of the cheapest methods in rendering the arid lands productive. Water was led from the nearest stream in a plow furrow and the irrigator in wet feet tried to spread it over the field by the use of a shovel. The small and cheap equipment, consisting of a walking plow and shovel, has given place to a large number of implements, and the simple, laborious manner of applying water has been broadened out into more than a half dozen standard methods, yet in studying the latest improvements it is evident that many of them are mere makeshifts and that much remains to be done before the water of western streams is efficiently and economically applied to arid lands. To aid in remedying this defect, the Irrigation Investigations of the Department of Agriculture were instituted nearly a dozen years ago, to be carried on wherever practicable, in conjunction with the western experiment stations.

One of the results of these investigations has been to show that a large part of the water annually diverted from natural streams is wasted by reason of the crude and defective means employed in its transportation, delivery, and use. While it is true that the waste in irrigation waters is diminishing, land being now irrigated in many parts of the West with one-third of the water formerly applied, yet there is still much to be done before the highest duty is reached.

The far-reaching importance of better methods of using water is readily seen when one considers that the extent of land now irrigated, based on the estimates of western state engineers and others, is approximately 13,000,000 acres. According to the results of measurements made by the Office of Experiment Stations the quantity of water which is diverted annually from streams and other sources of supply to water this extent of land approximates over 50,000,000 acre-feet. It is believed that only about one-third of this volume of water is utilized in nourishing plant growth, the balance being wasted. As the writer has frequently pointed out, all of this waste of water can not be prevented, but it is thought that enough might be saved to irrigate, under careful use, about 7,000,000 acres.

PREPARATORY STEPS IN IRRIGATION.

An irrigated farm resembles a city in that it should be skillfully laid out before many permanent improvements are made. In such preparatory work perhaps the most important feature consists of the location and construction of the network of ditches required to carry and distribute water to all parts of the farm and the head gates, turn-outs, pipes, flumes, and road crossings which these ditches make necessary. Farm ditches are of two kinds, temporary and permanent. The former is intended to last through but one season or for but one crop and its location is not important. The latter should be as definitely fixed as any other permanent improvement on the farm. The location of all permanent ditches should precede the division of the farm into fields, the building of fences, and the laying out of farm roads and lanes. The chief reason for this course is that there may be but one direction in which water will flow at the proper rate of speed. Too often the mistake is made of building ditches for only a part of the farm. This is pretty certain to cause, it may be years later, a complete change in most of the existing improvements or else a faulty arrangement of most of the essentials of an irrigated farm.

The head gate at the upper end of the supply ditch marks the point where the control of the canal company ceases and that of the water user begins. Sometimes the water is measured out to the user. A concrete hydrant having a weir and portions of two distributing flumes are shown in Plate XVII, figure 1.

Formerly all water channels pertaining to the irrigated farm were formed in porous earth which wasted a large part of the water through seepage. Wooden flumes were substituted later for part of the channels in earth, and pipes, concrete-lined ditches, and concrete flumes are now gradually taking the place of both earth and wood. The larger of the farm ditches in earth are made by first plowing a few furrows and afterwards removing the loose dirt by means of a wooden implement formed like the letter A. The smaller ditches can best be made by a lister plow attached to a sulky frame (fig. 7.)

The location and construction of the principal water channels for the farm is followed by the preparation of the surface of the fields for irrigation. Four more or less distinct kinds of lands under ditch are undergoing this change. There is the land which has been devoted to grain growing under the natural rainfall. The second class consists of lowland covered by native grasses, cacti, or low bushes. The third comprises the heavy sagebrush land of the mountain States, while the fourth contains more or less shrubbery and small trees interspersed among smaller desert plants. In the first two kinds deep plowing is all that is necessary before beginning the work of grading and leveling, but when heavy desert growths are encountered special contrivances must be used. A covering of sagebrush is most easily removed by dragging a rail or heavy timber over the field (Pl. XVII, fig. 3). The stumps which remain are either grubbed out by hand or are plowed out. The mesquite of the Southwest and pine and juniper trees of the Northwest are grubbed out by hand or are removed by stump pullers, dynamite, or fire.

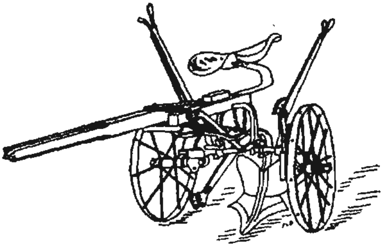


FIG. 7.—Lateral ditch plow.

FLOODING METHOD.

Flooding the surface of land from field ditches or laterals is the most common way of wetting soil. This method is common in the Rocky Mountain States, and the conditions which prevail there seem to be well adapted to this mode of applying water. It can be used on quite steep slopes and in various other ways fits in with the requirements of the irrigator on the more elevated lands. It consists in leveling, grading, and smoothing the surface of fields to such a degree

that water will readily flow over it. As a means of distributing the water over the field small ditches or laterals are located along the best routes. These form a network of channels which cut up the field into small strips, which are usually from 50 to 100 or more feet in width. Custom differs as to the direction of these field ditches. Sometimes they extend down the steepest slope of the field regardless of the fall, at other times they follow grade lines and extend from the head ditch in more or less curved lines across the field (fig. 8).

In preparing a field for this method it is first plowed and harrowed and then graded. Several good homemade implements are used to reduce the surface to an even, uniform grade. These have been described in publications of this Department.[a] A convenient implement to make field laterals is shown in figure 7. It consists of a lister

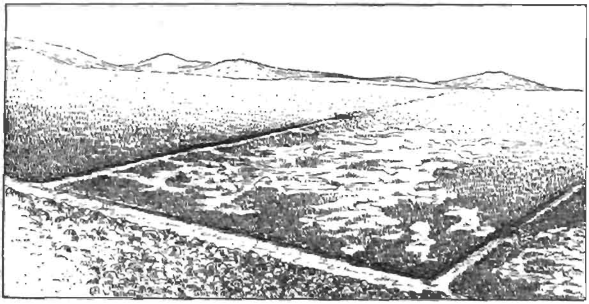


FIG. 8.—Flooding from field laterals.

plow, either 14 or 16 inch, attached to a sulky frame and drawn by three horses. When the ditches extend down the steepest slope of the field they are located by eye, but when they are located on grade lines, as in figure 8, some kind of a surveying instrument is frequently required to establish the grades. A suitable fall for these small channels is one-half to three-fourths inch to the rod.

CHECK METHOD.

The check method is illustrated in a general way in figure 9. It consists in the division of the field into checks, or compartments, each having a comparatively level floor space surrounded by a low, flat levee and a bordering supply ditch.

The checks are made in one of two more or less distinct ways. These are known as the "rectangular" (fig. 9) and the "contour." The

[a] Farmers' Bulletins 263 and 273.

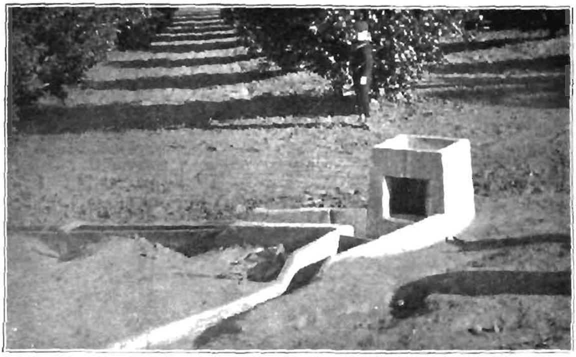


FIG. 1.—CONCRETE HYDRANT FOR MEASURING AND DISTRIBUTING WATER, ARLINGTON HEIGHTS, RIVERSIDE, CAL.

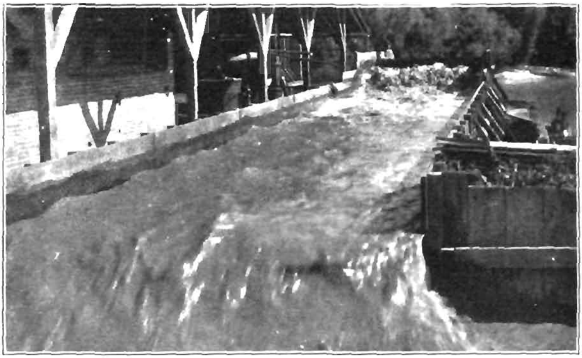


FIG. 2.—PUMPING PLANT FOR RICE IRRIGATION.

FIG. 3.—CLEARING BRUSH IN IMPERIAL VALLEY, CALIFORNIA.

boundaries of the former are straight, forming rectangles which are usually much longer in the direction of the least slope, while the boundaries of the latter conform to the natural slope of the land.

The field should first be carefully surveyed and the margins of the checks marked by a plow furrow or in some other way. The levees are formed by scrapers, which remove the earth from the high parts of the floor and deposit it on the levees. Leveling devices of various kinds are subsequently used to grade the floor and trim the low embankments. An essential feature in checking land is to arrange each tier of checks in such a way that each can be flooded from a supply ditch. Wooden gates in the ditch banks admit the required amount of water.

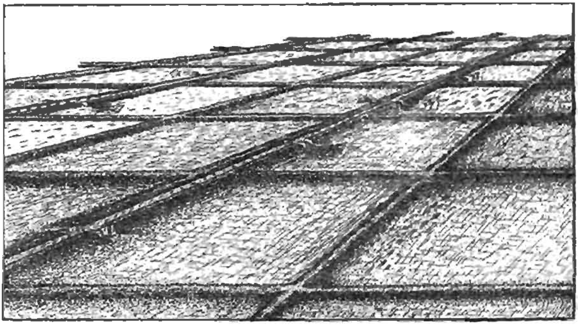


FIG. 9.—Check method of irrigation.

BASIN METHOD.

In all essential features the basin method does not differ from that just described. The fact that basins are used in the irrigation of orchards and checks in the irrigation of alfalfa, and the further fact that basins are much smaller and last but for one season, have served to distinguish between them and to accord to each a separate place.

Orchards are prepared for irrigation by this method by forming ridges of the loose earth midway between the rows of trees in both directions in the manner shown in figure 10. These ridges are made with ordinary walking plows by throwing up two furrows or else by a ridger. When the top soil is light and free from weeds only the ridger is required, but in more compact soils and on soils covered with weeds the surface should first be disked. This method is well adapted to the warmer portions of California, Texas, Arizona, and

New Mexico, where the winter irrigation of orchards is becoming a fixed practice. Water is then abundant and large quantities can be applied when the land is thus formed into small compartments.

BORDER METHOD.

One of the most common ways of fitting the surface to be flooded is to divide each field into narrow strips or "lands" by means of low, flat ridges of earth. These ridges extend from the head ditch at the upper margin of the field down the steepest slope to the bottom. When the slope is too steep they follow a diagonal course. In either case the field is divided into bands or borders, each of which is

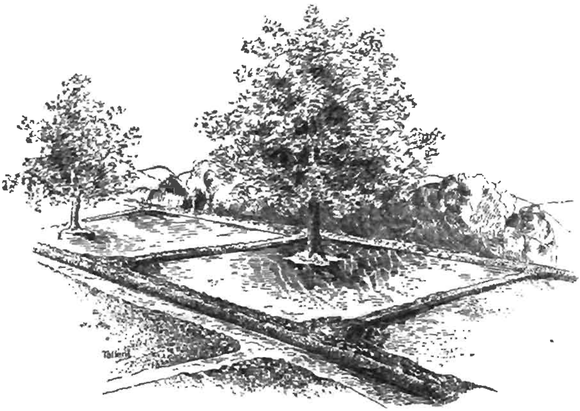


FIG. 10.—Basin method of irrigation.

watered separately. Figure 11 shows a portion of the head ditch having three gates, through which water is flowing into as many borders. The tract is first plowed or disked and then laid out in narrow parallel strips by plow furrows which mark the locations of the levees. On an average the levees are spaced about 50 feet apart and extend for a distance of 800 or more feet. They are usually formed with a scraper, which is driven back and forth in a direction at right angles to that of the markings, and as each full scraper crosses a marking it is dumped and the surface is again skimmed over to collect earth for the next levee. The ridges or levees thus formed are too steep and irregular and they are trimmed and flattened by suitable implements until their height is not more than 8

to 10 inches and the base is 6 to 7 feet wide. The land between the levees is carefully leveled and graded so as to permit water to flow in a thin sheet from the top to the bottom of each border.

FURROW METHOD.

With the exception of flooding from field laterals, the furrow method is more generally employed than any other. In its main features it is extremely simple. There is only the making of a furrow in cultivated soil for the passage and absorption of a small stream of water. From so simple a beginning many modifications have been evolved, most of which pertain to devices employed to distribute water among the furrows.

The common practice among unskillful irrigators on poorly prepared fields results in an uneven wetting of the soil, waste of water,

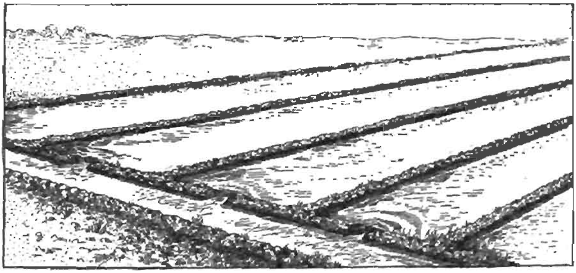


FIG. 11.—Border method of irrigation.

and reduced yields. Before watering such crops as orchards, sugar beets, potatoes, and corn, furrows are made between the rows with a light plow or cultivator. Water is then admitted into the head ditch at the top of the rows, its surface is raised by checks to the required height, and the furrows are supplied with water by making openings in the head ditch. The chief objection to this crude and inexpensive plan is the unequal distribution of water to the furrows.

A more even division of water among furrows can be made by using short tubes in the lower bank of the head ditch. These tubes are most frequently made of laths or slightly larger strips of boards, but may be made of cement, iron, or tin. By means of check gates, spaced near or far apart according as the grade is steep or flat, the surface of water is kept up to the proper height and the tubes are so placed that their upper surfaces will be on the same level and some little distance under water. Figure 12 shows the distribution of water

from such boxes. In the Northwest, where lumber is cheap, wooden flumes with small openings on one side are rapidly taking the place of earthen head ditches. These flumes vary in width from 8 to 12

FIG. 12.—Check in head ditch and distribution of water through wooden tubes.

inches, and the openings are controlled by metal or wooden gates in the manner shown in figure 13. Throughout the southern and central portion of California cement flumes and pipes of various kinds are quite generally used to distribute water to furrows. A common type of flume is shown in figure 14. In the process of building and before the cement hardens, small metal tubes are inserted on the side next to the orchard, the flow through each tube being regulated by a gate of the same material. When pipes are used a line is laid across the top of the tract to be watered at the proper depth below the surface, and at regular distances standpipes are inserted to bring the water to the surface, where it is divided between a number of furrows by special devices.

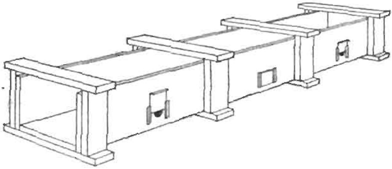


FIG. 13.—Head flume with openings to supply water to furrows.

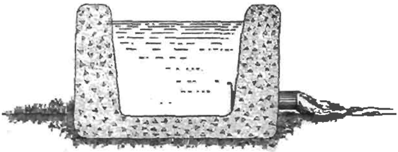


FIG. 14.—Section of cement head flume.

PIPE METHOD.

Where water is pumped from wells and where it is conducted from gravity canals under pressure, a convenient way of irrigating certain crops is by means of surface pipes. These pipes are made at the factory into convenient lengths, usually 10 feet, of various diameters,

and of different weights and kinds of metal. When not in use they are stored in an outbuilding or shed and carted to the field which is in need of water. In the main feed pipe, which is laid underground across the top of the field to be watered, there are standpipes at regular intervals, and a length of the movable pipe is attached to the lowest standpipe, using heavy canvas hose to make the connection. To this length others are attached until a line extends on one side of the field to within a short distance of the bottom. When the water is turned on, a section of canvas hose serves to distribute the water down the slope and as far on each side as the hose will reach. Several lengths of pipe are then removed and carried over to an adjoining strip. The hose is again attached and another block of land watered. In this manner an entire strip on one side of the field is watered, and the pipe is again strung out in such a way that the strip next to the first can be watered.

IRRIGATING RICE.

In 1909 the farmers of Louisiana, Texas, and Arkansas received over $18,000,000 for their irrigated rice crop. The well-drained, rich soil of that warm, humid region, when abundantly supplied with water at the proper time, is well adapted to the needs of this crop. Unlike most crops, rice must not only be flooded, but the top soil must be kept either continuously moist or submerged for a considerable part of the time. In the river sections of Louisiana two systems of culture, the wet and the dry, are employed. In the wet method the fields are flooded and plowed in the water to a depth of 2½ to 4 inches in April or early in May. The seed is sown broadcast and harrowed in, after which the water is turned off and the rice speedily germinates. In the dry method the land is plowed, harrowed, and seeded from the middle of March to the first of July in a manner similar to the treatment given other cereals. Under both methods a little water is turned on when the rice is 4 to 6 inches high. If the water is cold it must be used sparingly on early rice, while on late rice a sufficient depth of water must be maintained to prevent scalding. Unless the crop is attacked by insects the water after being turned on is kept on continuously until withdrawn previous to the harvest.

In the prairie districts of Louisiana, Texas, and Arkansas, where over 85 per cent of the total yield of this country is grown, the fields are plowed 2 to 3 inches deep at any convenient time between the harvesting of one crop and the planting of the next. Unless the soil is very hard no irrigation is needed before seeding. The most common varieties are Honduras and Japan rice, the acreage in the former being about double that of the latter. Japan rice grows more slowly, requiring about fifteen days more time to mature. Advantage is

taken of this to increase the length of the growing season, as well as that of the irrigation season, in order that the largest possible acreage may be handled by a given number of laborers. The time of seeding extends from the middle of March to July. The Honduras rice is planted first and there is usually sufficient rainfall to germinate the seed. In case irrigation water is needed to sprout the seed, it should not be allowed to remain more than a few hours or it will cause the seed to rot. Water, as a rule, is not needed on the Japan rice, or again on the Honduras rice, until the plants are from 4 to 6 inches high. Water is at first used sparingly, but the surface is flooded when the rice attains a height of 6 to 8 inches. As in the case of the river rice, the fields are continuously flooded from this time until shortly before the crop is harvested.

In the river districts of Louisiana the water required is obtained by siphoning it over the levees from the river, or, in case of low water, from pools into which it has been pumped. In the prairie districts large canal systems supplied by pumping plants (Pl. XVII, fig. 2) and irrigating extensive tracts are common. The pumping plants operate against heads ranging from 10 to 70 feet, and are made of sufficient capacity to furnish 7 to 8 gallons per minute for each acre irrigated. One cubic foot of water per second would thus serve about 60 acres.

Modifications of the check method of land preparation prevail throughout the rice districts. In the past the levees were far apart, but later practice has fully demonstrated the advantages of having three to five contours in each foot of vertical elevation instead of only two, as was the former custom. This allows a corresponding reduction in the height of the levees and the size of the checks. The lesson which experience has taught in the rice fields of the Gulf States, as well as in the San Joaquin Valley of California, is that the low levee with a broad, evenly trimmed base is best and presents the least obstruction to farm operations.

IRRIGATING ALFALFA.

Stated generally, alfalfa is irrigated by flooding in the Rocky Mountain States, from furrows in the Northwest, and in borders and checks in the Southwest and California. The amount of water, usually designated the "head," required for flooding varies from 50 to 200 miner's inches. This quantity is conveyed to the highest point of the field in a supply ditch and is there divided among two or more field laterals, the number served depending on the total head. The least head for any one lateral is seldom less than 40 inches. When water is admitted into a lateral it is checked at a point 100 feet or more below the place of entrance. These checks may be earth, coarse manure covered with earth on the upstream face, canvas, or wood. The effect of any one of these checks is to raise the water until

it flows over the low places or through openings made with a shovel. This partial flooding and absorption by the soil is shown in figure 8. Any excess water is caught up by the next lower lateral and when the soil is thoroughly soaked to a depth of about 12 inches, the check is either broken or removed to a point lower down and the flooding of the adjacent piece of land is begun. One man can water from about 2 to 5 acres in twelve hours.

The fine soils found in parts of the Northwest have a tendency to run together and form a crust after water is spread over the surface. In order to prevent puddling and baking, which injure crops, the soil is moistened from furrows. The spacing of the furrows varies from 12 to 48 inches, depending on the readiness with which the water moistens the dry earth on each side of the furrow. The furrower shown in figure 15 or some modification of this implement is used to make the furrows. Water is turned into these from head ditches, usually through spouts or tubes (fig. 12). When a field is properly

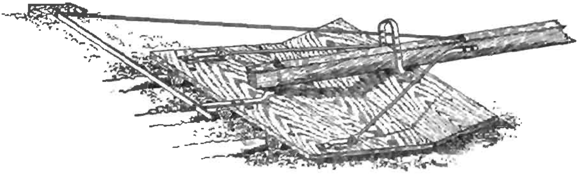


FIG. 15.—Furrower.

prepared the task of irrigating by this method is easy. In sandy loam and with furrows 500 to 1,000 feet long the water is allowed to run for about two days. At first a larger head is used, but after the bottom of each furrow is wet a smaller stream will suffice.

In irrigating alfalfa in checks (fig. 9) large heads are the rule. In the Modesto and Turlock irrigation districts of California 10 or more cubic feet per second is commonly used. With this head three or four checks, each averaging about three-fourths of an acre in extent, are flooded at one time, and in ten hours it is possible to irrigate 16 acres to an average depth of 6 inches. With such facilities for distributing and controlling water, the wetting of the soil becomes an easy and simple task.

In irrigating alfalfa in borders in the Yuma Valley, Arizona, a head of about 4 cubic feet per second is divided between 3 or 4 borders and the time required for the thin sheet of water to traverse a field 40 rods long depends on the slope, soil, crop, and thoroughness of irrigation desired. The usual time is one hour.

IRRIGATING GRAIN.

Grain occupies an important place in irrigated farming. Such crops as alfalfa, beets, potatoes, and fruit give much greater returns, but grain growing must needs be practiced to round out the requirements of most diversified farms under irrigation. To the new settler with little means it brings in quick returns; it is one of the best preparatory crops to sow on raw land, and it fits into the ordinary crop rotation of the West made up of grain, alfalfa, and sugar beets or potatoes.

Grains of all kinds are irrigated mostly by the flooding method (fig. 8), but borders and furrows are also used to a limited extent. The process of flooding grain fields from field laterals is very much the same as that for alfalfa, except that the laterals are spaced closer. Less care is likewise taken in forming these channels, since they are not intended to last beyond one irrigating season. After the last watering and before the grain is ready to harvest the field ditches are filled in so as not to interfere with the reaper.

In the Yakima Valley in Washington grain is irrigated from furrows spaced 24 to 30 inches apart and in the Imperial Valley in California it is flooded in borders about 50 feet in width and often a quarter of a mile long.

The low duty of water on grain land is due largely to the newness of the ground and the rough condition of the surface. Results of measurements made in different States of the West show that large quantities of water, often exceeding 6 acre-feet per acre, are frequently applied to grain fields. It is apparent from the low or average yields obtained that the greater part of the water is wasted. Under skillful use more than 2 acre-feet per acre is seldom needed.

IRRIGATING SUGAR BEETS.

The growing of sugar beets under irrigation is highly profitable when a heavy tonnage can be secured. To accomplish this desirable end, alfalfa fields are frequently plowed under to make way for sugar beets, and when no rotation is practiced the best soil is usually selected for this crop. Perhaps the best soil for sugar beets is a well-drained clay loam with just enough sand or silt in its composition to work freely. Deep plowing is essential, and as a rule it pays to subsoil. The two operations loosen the soil to a depth of 14 to 16 inches. Outside of California, sugar beets are irrigated by furrows. These start from a head ditch running across the upper margin of the field and extend down the steepest slope or diagonally if the slope be too great. The furrower shown in figure 15 may be used to form the furrows, provided the runners are spaced to correspond with the beet rows and also provided that the soil is loose and free. Shovels attached to

cultivators are, however, the most convenient implements for this purpose. It is well-nigh impossible to distribute water evenly in long furrows, and for this reason their length should not exceed a general average of 350 feet. Fields that are 600 to 1,000 feet long should be provided with at least two head ditches, the lower one acting as a drainage channel for the upper half of the field and a supply ditch for the lower half.

Deep plowing, thorough cultivation, leveling, grading, and furrowing should all be done with skill and care, but none of these is so difficult to manage as an even distribution of the water among the furrows. In perhaps 90 per cent of all beet irrigation too much water is forced into some furrows, resulting in flooding parts of the crop, which invariably suffers in consequence. Some device like those shown in figures 12, 13, and 14 should be used to regulate the quantity of water entering each furrow. Each small stream should then be allowed to run until the absorption which goes on in its passage down the furrow has sufficiently moistened the soil around the roots.

As regards the right time to irrigate and the proper quantity to apply, the best guide is a close observance of the crop itself. Sufficient moisture should be given to the soil to enable the beets to maintain a steady, vigorous growth. When water is applied too early it produces leaves at the expense of roots, and too late waterings cause the plants to mature before they have their growth. A depth of 4 to 5 inches over the surface is usually applied at each watering and the number of applications ranges from 2 to 4 in a season, the ground being cultivated as soon after each irrigation as practicable.

IRRIGATING POTATOES.

The growing of potatoes in a commercial way in some of the arid States is rapidly becoming an important industry. Its success is largely due to an interchange of other irrigated crops. A common rotation on the more fertile bench soils of Greeley, Colo., consists of grain as a nurse crop to alfalfa the first season, then two years of alfalfa, followed by two years of potatoes. In the San Luis Valley of Colorado the common field pea is substituted for alfalfa, the most common rotation being one to two years of peas, one to two years of potatoes, followed by one to two years of grain.

The rotation of crops in potato growing has an important bearing on the way in which the fields are prepared for irrigation and the manner of applying water. Neither the check nor the basin method is suitable, since potatoes can not well be flooded. The choice lies between furrows and flooding from field laterals, since it is easy to change from the flooding method followed in alfalfa, peas, or grain to the furrow method followed in potatoes. In furrow irrigation the

size of the field, the slope, and the character of the soil cause the length of the furrow to vary from a minimum of 200 feet to a maximum of 1,400 feet. From the standpoint of the irrigator it is not advisable to increase the length beyond 660 feet. Sometimes the furrows are not more than 6 inches deep; at other times they are 12 inches deep. A common practice is to have the bottom of the furrow about 12 inches below the crown of the plant. In most other respects the irrigation of potatoes does not differ from that of sugar beets.

IRRIGATING ORCHARDS.

Gently sloping land is preferred for irrigated orchards. A fall of 10 to 20 feet to the mile insures good drainage and the soil is not eroded by small streams of water. On very flat slopes the excess water from irrigation has frequently to be removed by artificial means and on very steep slopes the difficulties of applying water are much greater.

Furrow and basin irrigation are the usual methods employed, but the former is more common. In setting out land for commercial orchards a section is usually divided first into 40-acre divisions and then into 10-acre tracts. The lateral ditches supply the divisions, and individual owners control the respective tracts. When the width of driveways is deducted the length of a tract occupied by trees is seldom more than 600 feet. This distance governs the length of the furrows. The watering of orchard trees during the first season after transplanting is most commonly done through two furrows spaced 4 feet on each side of the tree. As the roots expand more furrows are added, and about the time the tree begins to bear the entire space between the rows is moistened, the number of furrows necessary to accomplish this depending on the soil, depth of furrow, cultivation, etc. It has been shown[a] that evaporation is less from furrow than from surface irrigation and that deep furrows conserve more water than shallow furrows. In citrus orchards, where water is valuable, a depth of furrow of 8 inches is common.

In conducting a supply of water along the upper margin of an orchard and in distributing the flow evenly among a large number of furrows, various plans have been adopted. Although the earthen ditch is still common, it is no longer regarded with favor. Wooden spouts (fig. 12) or short lengths of pipe inserted in the lower bank of the feed ditch are cheap and fairly effective. Wooden flumes (fig. 13) with auger holes about 1 inch in diameter spaced every 4 feet are quite effective, but the wood soon deteriorates and in time decays. The cement flume shown in figure 14 overcomes this objection, but

[a] Office of Experiment Stations Bulletin 177.

both interfere with the free use of teams. For this and other reasons many orchardists prefer to conduct the water in a pipe and bring it to the surface through a short standpipe located at the head of each row of trees. This system is shown in part in figure 16. Each standpipe, through the small openings made in its shell slightly above the ground surface, can supply all the furrows belonging to any one row of trees without interfering to any appreciable extent with the free passage of teams.

The quantity of water applied to orchards during an irrigation season runs all the way from 1 to 5 feet. Where more than 3 feet in depth is used it is pretty safe to conclude that the excess is wasted. In districts of scanty rainfall and heavy evaporation, the most profitable crops are produced with the use of 20 to 30 inches in depth over the surface throughout the season. One of the most productive apple orchards in the vicinity of Wenatchee, Wash., is irrigated five

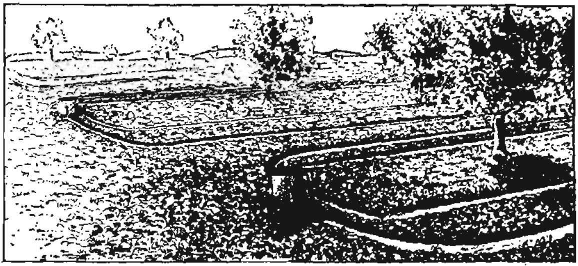


FIG. 16.—Standpipe supplying water to furrows in orchards.

times between the middle of May and the last week in September, from 4 to 5 inches in depth being applied at each watering. In southern California it requires fully 3 inches per month in depth over the surface, including both rain and ditch water, to keep citrus trees in a good condition. For the past seven years the amount of irrigation water which has been applied to the lands under a canal at Riverside, Cal., which serves about 9,000 acres, has averaged 27¾ inches in depth over the surface. The average rainfall of this locality for the seven years was 10½ inches, thus making the total 38¼ inches, or a trifle more than 3 inches per month.

In the introductory paragraph of this article it was estimated that the water now diverted from stream channels and other sources in excess of that required to produce satisfactory yields is sufficient to irrigate 7,000,000 acres of land. Very little of this excessive use is deliberate waste. A large part of the water taken from natural

streams is lost before it reaches the fields of the farmers and another large part of it results from the failure to adapt methods to soil and crop conditions and to the character of the water supply. In deciding upon the best method for given conditions, all these factors must be considered, and the crop and the soil should be examined often to see whether the water is being properly distributed to the roots of the plants.

PROGRESS IN METHODS OF PRODUCING HIGHER YIELDING STRAINS OF CORN.

By C. P. Hartley,
Physiologist, in Charge of Corn Investigations, Bureau of Plant Industry.

INTRODUCTION.

Our best evidence points to Mexico as the original home of Indian corn and to teosinte (Pl. XVIII, fig. 1) as a primitive type. As a disseminator of the seed of this our most valuable plant, man has greatly influenced its evolution. His influence in the line of seed selection probably began earlier than any records concerning the plant. Agriculturists of the most primitive type may be supposed to have saved the largest ears for seed, and the multicolored varieties still grown by many Indian tribes indicate that their preference for showy, bead-like types caused the perpetuation of such types.

PIONEER WORK OF CORN IMPROVEMENT.

Though of a crude nature, the seed-corn selection of fifty years ago was progressive for that period and of much ultimate value. Very much more credit is due these early attempts at corn improvement than is usually attributed to them, for many of the best types at the present day are but new-named selections taken but a few years ago from some of the older established strains. It is especially encouraging in connection with corn-improvement work by selection to find some of these types which have undergone long periods of systematic seed selection still proving most productive in their respective localities. Thus, Reid Yellow Dent, grown as a variety from the year 1847, Mosby Prolific, from the year 1876, and Boone County White, from the year 1880, are still preferred by many farmers in the localities in which these strains originated.

Very naturally the first organized efforts made toward corn improvement consisted of attempts to determine which of the existing strains could be most profitably grown. Variety tests have been an important factor in corn-improvement work, and of course must continue to be, for it is only by tests that improvement or superiority can be determined.

Multiplication of variety names caused by affixing new names to old strains proves a serious drawback in connection with this work

and causes much unnecessary labor. For the good of all concerned the name of a strain of corn should not be changed until the corn itself has been sufficiently improved or changed to render it distinct in some important character from the parent strain. The Department of Agriculture is keeping as complete a record as possible of the origin and history of improved strains of corn that are under process of development in different portions of the United States. All engaged in the production of such improved strains will benefit themselves and the interested public by supplying the Department with the important points regarding the strains of corn with which they are working. Upon request a printed form for this purpose will be supplied by the Office of Corn Investigations.

ISOLATION OF THE BREEDING PLANT.

The testing of varieties led to the observation of a striking difference in the profitableness of various strains of corn and also to the effects due to the crossing of different corns planted in the same field. It became at once evident that a great advantage would arise from the planting of the most productive strains, and that in order to retain them as distinct and reliable strains it would be necessary to plant each strain well isolated from all other kinds of corn blossoming at about the same time.

EAR-TO-ROW OR CENTGENER METHOD OF PLANTING.

As the various ears in many of the so-called varieties of corn differ among themselves fully as much as certain varieties differ, an isolation of the varieties was soon followed by a separate planting of individual ears (Pl. XVIII, fig. 2, and Pl. XIX, fig. 1). By this method the fact has been established that seed ears of equally fine appearance in regard to all apparent characters often vary as much as 50 or 75 per cent in rate of production, as well as in other important characters, and that the variation in these particular characters is transmitted to the progeny. The introduction of this method of breeding was largely instrumental in bringing about a very wide awakening as to the possibilities of corn breeding. The public press became filled with articles descriptive of the results to which breeding might lead, pointing out that corn could be converted into a balanced ration, that the oil, protein, and starch content could be vastly increased, and that the possibilities of the plant were practically unlimited.

By careful and persistent labor the possibility of these claims has been demonstrated.[a] However, the effect has not been so general

[a] Bull. 128, Illinois Agricultural Experiment Station, entitled "Ten Generations of Corn Breeding," 1908.

and far-reaching as the press had predicted. General application of the results has been prevented by the commercial situation, which fixes practically the same price for all corn regardless of quality. So long as corn containing 25 per cent of water brings the same price a pound as corn containing but 15 per cent of water, it is unlikely that corn 4 or 6 per cent above the average in oil or protein content will be very generally sold at a premium. We can not buy and sell corn justly or speak accurately regarding yields without taking moisture content into consideration. In comparing yields in Connecticut or Wisconsin with those in Texas or Oklahoma, a difference of 10 or perhaps even 30 per cent should be made in favor of the State in which the corn dries thoroughly before it is harvested.

CORN FOR SPECIAL PURPOSES AND SPECIAL CLIMATIC CONDITIONS.

A very common mistake, and one that corn breeders can easily avoid, is the attempt to grow larger varieties than will mature properly. The advantage of a broad knowledge of different varieties is brought out by tests made in southern Wisconsin through an appeal from a large number of farmers who had suffered losses from failure of their corn to mature. A number of early varieties were tested and a strain that had been bred as Minnesota 13 by the centgener method for high-yielding power at the Minnesota experiment station was found most satisfactory. Breeding work with this variety, under U. S. Selection 133, has continued, and farmers quite generally in the southern part of Wisconsin are now growing it in preference to the large-eared and later maturing varieties previously grown. (See Pl. XIX, fig. 2, and Pl. XX.)

In working for drought resistance in Texas it was very noticeable during seasons of drought that strains from dry portions of Mexico and other semiarid regions were far superior to all varieties from the corn belt. Breeding work was begun with Laguna corn from Mexico, which work has proved successful. It was soon learned that a region where dry seasons were universal rather than frequent was necessary for the fullest degree of success in breeding a variety for ability to produce well during seasons of drought.

ACCURATE DETERMINATION OF THE INHERENT PRODUCING POWER OF DIFFERENT EARS.

It is an exceptional piece of land that will not yield varying results from different rows of corn planted with seed as nearly uniform in quality as it is possible to obtain. Various methods of obviating this difficulty have been used, but none thus far have proved entirely satisfactory. On tracts of land of the most uniform nature duplicate and triplicate plantings are quite satisfactory. In conjunction with

duplicate plantings check rows are frequently used. By this method a composite sample of seed from a sufficient number of check ears is used in planting every fifth or tenth row. In place of the composite sample an equal number of kernels from each of a picked lot of ears is sometimes planted in each of the check rows.

There exists great need of working out some accurate checking method. Curtis H. Kyle, of the Office of Corn Investigations, is employing a method which consists of growing in each hill two stalks 8 to 10 inches apart, regarding which it is definitely known that the stalk on one side of each hill is from the breeding ear and that on the other from a check ear. By this method the productiveness of 10 breeding ears can be compared with the productiveness of a single check ear, or 100 breeding ears compared with 10 check ears. The productiveness of each of the 10 check ears is then compared by the same method with an eleventh check ear. The principle upon which this checking method is based is that the intermingling of the roots of two stalks in the same hill will place them under quite uniform conditions. Fifty hills planted in this way and the yield of each stalk determined afford 50 comparisons of the producing powers of the breeding ear with those of the check ear. This method is applicable in ascertaining the relative productiveness of similar varieties. Hand-pollinated ears may be found best suited for use as check ears because of less variation in the yielding power of the various kernels of such ears. Accurate tests made in 1909 by the Department of Agriculture prove that the small kernels at the extreme tip of the ear yield less and give a greater percentage of barren stalks and poor ears than kernels from the middle portion of the same ear. The large kernels from the extreme butt end proved as productive as the kernels from the middle portion.

THE REMNANT SYSTEM.

Of the various forward steps in the production of higher yielding strains of corn the inauguration of the remnant system of corn breeding by C. G. Williams is worthy of special attention. In planning the method followed by the Ohio Agricultural Experiment Station and the Ohio Corn Improvement Association, Mr. Williams provides for an ear-to-row test plat each year in which ears are accurately tested for productiveness. One-half of the kernels from each ear tested are retained under the term "remnant." The next year the remnants of a few, usually four, of the highest yielding ears are planted in an isolated breeding plat, and the stalks from all of the ears planted in this patch, except those from the highest yielding ear, are detasseled. Seed ears are selected from the detasseled rows and grown the next year in a multiplying plat to supply seed for general planting. After this method is under way on any farm, there is

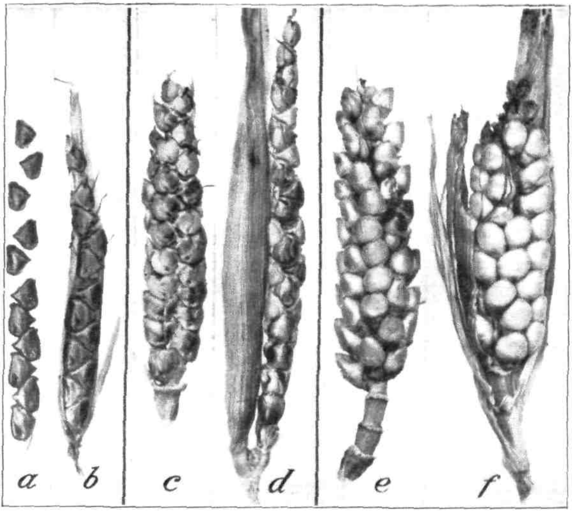


FIG. 1.—TEOSINTE AND ITS HYBRIDS WITH INDIAN CORN.

[*a* and *b*, ears of teosinte, showing an entire absence of cob, kernels being attached to each other; *c* and *d*, ears of first-generation cross of teosinte and Indian corn; *e* and *f*, *Zea canina*, a fourth-generation hybrid of teosinte and corn. All are natural size and were grown by the Department of Agriculture in 1900 on the Potomac Flats, near Washington, D. C.]

FIG. 2.—AN EAR-TO-ROW TEST PLAT, SHOWING HUSKING METHOD USED.

[Seed is first selected from the best plants of every good-appearing row. Each row is then harvested separately and its production recorded.]

FIG. 1.—AN EAR-TO-ROW TEST PLAT WITH CORN HUSKED, SHOWING A METHOD USED IN ASCERTAINING WHICH SEED EARS HAVE YIELDED BEST.

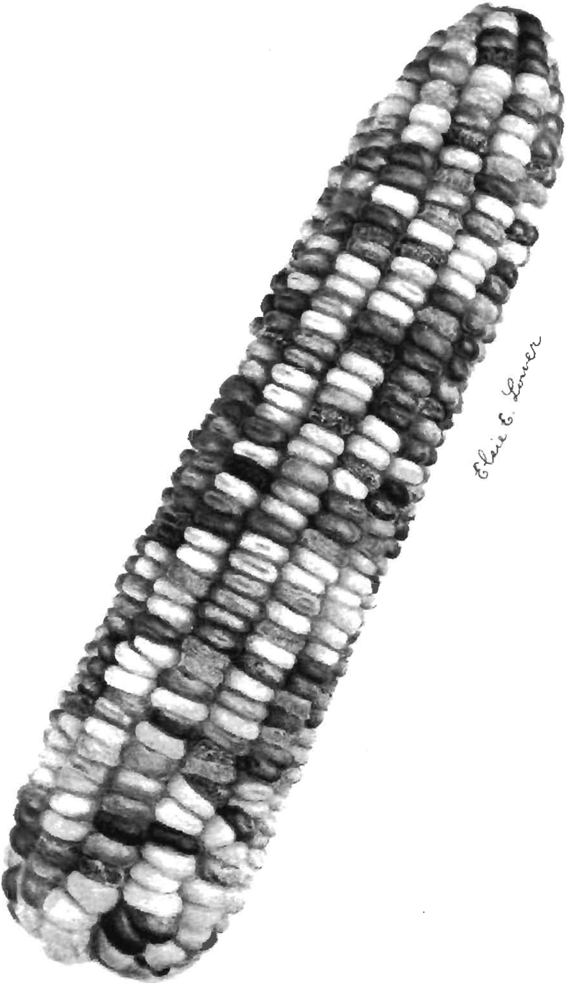
[The weight of seed from each row is added to the weight of the rest of the ears to determine the total production for each row, i. e., each seed ear planted.]

FIG. 2.—FIELD OF CORN OF U. S. SELECTION 133 AT OCONOMOWOC, WIS.

[This field yielded 7,200 pounds of mature, sound ears to the acre in 1907, a season so cold and backward that all larger and later varieties failed to mature. See Plate XX for select ears.]

EARS OF CORN OF U. S. SELECTION 133.

[Adapted to the conditions of southern Wisconsin. Stalks 6 to 7 feet tall; ears 7 to 8 inches in length; ears shell 88 per cent grain. Matures in 90 days of good growing weather. Field view shown in Plate XIX, fig. 2.]



EAR OF CORN PRODUCED BY A PLANT THAT GREW FROM A KERNEL OF BOONE COUNTY WHITE DENT THAT RESULTED FROM A POLLINATION WITH BLACK MEXICAN SWEET-CORN POLLEN. NATURALLY POLLINATED. NATURAL SIZE.

maintained on the farm each year a small isolated breeding plat, a multiplying plat, and an ear-to-row test plat. The ear-to-row test plat does not require isolation, for no seed is taken from it. This method successfully excludes from the breeding plat all individuals except those whose producing power has been found to be very high.

According to views recently advanced, the employment of a very large number of ears in an ear-to-row test plat and the planting the next year of the remnants of only those of high yielding power accomplish practically all that can be accomplished with that strain of corn by selection. However, as it is practicable to test but a comparatively few ears of a variety during a particular year, it is advisable to maintain the ear-to-row test plat each year. By so doing the chances of finding the very highest yielding ear are increased. If it were possible to test all the ears of a variety during one season such a test would reveal the highest producing ear for the particular climatic conditions of that season. Tests conducted each season will tend toward the selection of the best producing ears for all or average seasons. This, of course, is what is desired.

The Department in some localities is utilizing to good advantage a combination of breeding and variety test work which embraces the remnant system. After testing all likely kinds of corn in a new locality for a few years, it becomes quite evident that comparatively few are worthy of further trial. Of these few a large number of ears from superior plants are included in an ear-to-row test plat. This test affords a comparison of the yields of the varieties and also of the selected ears within each variety. The remnants of the highest yielding ears of the highest yielding variety are then planted the next year in an isolated breeding plat. When we recall that the variations in yielding power found among the ears of a variety are as great as the variations among varieties, and sometimes greater, the advantages of this method are apparent. Tests of individual ears of seven leading strains planted by this method in South Carolina last year showed that the degree of variation in production between the ears within any one of the varieties was from two to three times as great as the variation in production of the seven local varieties. The choice of a high-yielding variety is important; the choice of high-yielding ears is even more important.

INFLUENCES DUE TO HYBRIDIZATION.

The ease with which strains of corn cross or interbreed is in some respects detrimental to the most rapid improvement in production. The ease with which crosses are made has led many to make crosses between unlike types of corn largely through curiosity and without any definite object in view. On the other hand, the difficulty in pre-

venting cross-breeding has deterred a majority of those who have made crosses from prosecuting their labor to a profitable termination. The effects of pollen from corn of different classes and colors reveal strikingly some results of the silent processes of nature, and often lead corn experimenters from the path of their planned work to promiscuous crossing for the mere pleasure of observing the wonderful changes.

An exhibit of a single stalk of corn bearing one white sweet-corn ear, one black sweet-corn ear, one yellow field-corn ear, and one white field-corn ear at once awakens a desire to study the causes of such wonderful results. In Plate XXI is shown a naturally fertilized ear that grew from a kernel of Boone County White that had been fertilized with Black Mexican pollen. From this ear, which contains kernels differing greatly in color and composition, can be produced distinct types of corn. By a few years inbreeding or mating of proper individuals there can be produced the original Boone County White and the original Black Mexican, together with a field corn that could appropriately be called Boone County Black and a sweet corn that could with equal propriety be called White Mexican.

MUTATIONS, OR SPORTS.

Ardent supporters of the mutation theory believe that from a particular strain of corn no higher yielding strain can be produced than that exhibited by the best individual already existing within the strain, unless by chance the strain mutates or makes a sudden departure from its previous bounds along the line of higher production. A sudden departure or change of character or characters along any line, if transmitted from generation to generation, is termed a "mutation." These mutations occur frequently in corn, often along undesirable lines, and carefully conducted breeding work indicates that they also occur along the line of productiveness.

FACTORS INFLUENCING PROGRESSIVE WORK.

A broad knowledge of the underlying principles of heredity and evolution is necessary in the production of the most effective results. In addition to this there is necessary a practical working knowledge of the peculiarities of the plant with which breeding work is being done. It will not do to rely on general deductions that have been made through results obtained by work with other plants. There is too great a tendency to draw sharp lines of classification and bounds within which nature is thought to operate. While formulated rules are to be kept under consideration, the plant breeder must bear in mind that he is working not with inorganic bodies but with bodies that are ever evolving and changing and that the laws

which govern under some conditions may under other conditions be set aside by superior laws. It is highly important for plant breeders to know that certain characters obey Mendel's law and to be able to distinguish the dominant characters from the recessive, and it is necessary to bear in mind that under differing conditions the degrees of dominance or recessiveness may differ or cease to exist. Starch composition is generally recognized to be dominant to the composition of sweet-corn kernels to such an extent that, whenever pollen of pure-bred starch corn is placed upon silks of sweet corn the resulting kernels have a starchy composition. Under ordinary conditions a certain antagonistic tendency exists which prevents the blending of these two characters, though further investigation will likely determine conditions under which a blending may be effected. There already exist varieties of the evergreen type which exhibit a blending or at least a mixing of these two characters. An indication of such blending is shown in some of the kernels of Plate XXI.

As yield is the character of paramount importance, and as this character can now be determined only by laborious field tests, it is of the utmost importance that careful consideration be given to plant characters that may be correlated to yield. Discussions along this line have been almost wholly confined to characters of the ear. A careful tabulation of yields as compared with other ear characters covering six years' work with four varieties, embracing in all more than 1,000 ear-to-row tests of production, indicates that no visible characters of apparently good seed ears are indicative of high yielding power. It is reasonable to expect, however, that a careful study of the entire plant in connection with its environment will reveal such characters.

Fancy points are so impressive and so easily illustrated that for a number of the first years of the present century corn breeding was almost synonymous with consideration of score-card points and fine displays of selected ears. The good feature connected with this work was the interest aroused in the subject of corn improvement. Unfortunately the impression became quite prevalent that an adherence to fancy points in selecting seed ears would rapidly lead to increased yield to the acre. The fallacy of such reasoning is found in the fact that no correlation is known to exist between these attractive characters and productiveness. Some who for a few years have been guided solely by fancy points in selecting their seed ears have become so discouraged because their yields have not greatly increased that they are now ready to discredit everything pertaining to corn breeding. This loss of faith in systems of corn breeding has stimulated theorists to be first in publishing new systems of breeding and in soliciting corn growers to put them to the practical test. Theories

are exceedingly helpful as working bases but may prove exceedingly harmful when recommended to farmers as substitutes for practices that have successfully stood the test of application.

Dishonest persons who, by extensive advertising, sell ordinary corn as highly improved seed very greatly diminish public confidence in principles of corn improvement and do great injury to the purchasers and to conscientious corn breeders. Frequent exposures of such dishonesties will diminish their detrimental effects. Persons knowing of such practices are asked to report the facts to the Department of Agriculture.

SAFE PROCEDURE ACCORDING TO EVOLUTION AND HEREDITY.

Among students of heredity there is much discussion concerning comparative values of variation, mutation, and hybridization in connection with plant breeding. It should be highly gratifying to those who are selecting their seed corn from superior individual plants to know that the method they are following meets the requirements of the students of all these methods. If fluctuating variations of value can be caused to accumulate, it seems probable that improvement would be readily accomplished by propagating from the best. This is what the best corn breeders are doing. If chance mutations of value are the only hope, he who is searching his cornfields for the superior plants is most likely to find desirable mutations. If hybridization is the key to success, nature is constantly producing crosses among all kinds of corn grown in proximity. Breeding pure, reliable, high-producing strains is thought by some to consist only of a weeding out of all but the best and that improvement beyond this is impossible. If true, such accomplishment is well worth the labor. If untrue, all the better, for then the corn breeder is in a fair way to excel all the previous existing forms by selecting and propagating from the best, so that whatever theory be correct, the worker originating pure, reliable, productive strains is on the right road. Furthermore, if it should eventually prove that the crossing of unrelated strains is necessary for advancement beyond the best individuals of a strain, the producer of reliable, high-yielding strains is still on the right road, because the crossing of two such improved strains is more likely to produce something still better than is the crossing of inferior strains. When crossing is practiced, good results in a particular direction depend largely upon the selection of the strains and of the individuals within the strain.

Our average acre production has not increased sufficiently to meet the expectations of many who ten years ago were taught the possibilities of corn improvement. This failure has been due to the fact that a very large majority of corn growers have neglected to apply improved methods. It is encouraging, however, to know that,

although our farms have rapidly lost their virgin fertility, the yields for the entire United States for periods of five years, from 1870 to the present time, are as follows: 26½, 28, 24, 24, 23, 26, 24, and 27 bushels per acre. It is quite probable that if the large percentage of virgin land that was planted to corn a half century ago could be planted with our seed of to-day better yields would be obtained.

INDISCRIMINATE CROSSING NOT ADVISABLE.

In Bulletin 25 of the Illinois Agricultural Experiment Station, published in 1893, and Bulletin 31, published in 1894, the authors show that in the case of 9 crosses, the most promising of 30 crosses made, the yields were in excess of those of the parent varieties crossed. From these results they advised the planting of two varieties in alternating rows, the detasseling of one, and the saving of seed from it in order to take advantage of the increased yield due to crossing. Recently results of the same nature have been reported by Dr. Edward M. East[a] and Dr. George H. Shull.[b] The results show that in some instances crossed seed produces better than the average of the strains crossed. It does not follow that crossed seed usually produces better than the average of the strains crossed. Crossing experiments conducted by the Department from 1900 to 1903 show that in some instances cross-bred seed produces less than the average of the strains crossed, and that in some instances the crosses were practically sterile, forming no ears, and in one case forming no pollen, although the tassels developed and matured.

Future work must determine which strains can be advantageously paired in producing crossed seed for general planting. If future work should prove that a certain first-generation cross between two particular strains will yield from year to year more corn than any pure-bred strain, there will be even stronger reasons than at present for experienced corn breeders to supply farmers of their respective localities with seed. It would then not only be advisable to keep the two strains in a proper evolutionary stage for crossing, but also necessary each year to accomplish the crossing. These results could with some extra labor be accomplished by every corn grower who is capable of maintaining one isolated seed plat. This isolated seed plat should be large enough to produce twice as much seed as would be needed for planting the general crop. It could be planted with a two-row planter—one variety in one box of the planter and the other variety in the other. One variety would be detasseled, and thus afford the crossed seed for the general crop. The other variety would afford pure-bred seed for the isolated plat of the two following seasons and would, in turn, the next year be detasseled to afford crossed seed.

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[a] The American Naturalist, vol. 43, March, 1909, p. 173.

[b] American Breeders' Association, vol. 5, Jan., 1909, p. 51.

Thus, one isolated plat would maintain indefinitely a supply of pure and acclimated seed of each of the two pure-bred varieties and also produce crossed seed enough each year for the general crop. With this method can be combined the ear-to-row system and the remnant system so as to improve in production the two varieties necessary in producing each year's supply of crossed seed. However, it is believed that the careful and complete detasseling necessary to keep the two strains pure would require so much close attention that the growing of the two pure-bred strains by different men on different farms would be more satisfactory. The crossing would then be a distinct operation, and if the detasseling were not done with absolute accuracy the purity of the original strains would not be lost.

DESIRABLE CHARACTERS TRANSMITTED.

The tendency of high-yielding ears to transmit this character and a practical and profitable application of selecting seed for increased yield is brought out by the following records of one season's work. The table is a reproduction of the field records and the rows are numbered in the same order they occupied in the test plat. The arrangement followed was employed to overcome to some extent the effects of inbreeding and proves admirably adapted for comparing the yields of ears selected from high-yielding rows of the previous year's breeding plat with ears of equally fine appearance taken from a general field of the same corn. Those ears from the general field were given Roman numerals and planted in alternation with those from the best rows of the previous year's breeding plat.

Yields of ears of corn selected from high-yielding breeding rows compared with yields of ears selected from a general field of the same corn. [a]

Row No.	Ear No.	Pounds of ears harvested.	Row No.	Ear No.	Pounds of ears harvested.	Row No.	Ear No.	Pounds of ears harvested.
1	XVI-1	170	16	5-3	194	31	XVI-21	185
2	1-1	177½	17	XVI-12	169	32	11-1	181
3	XVI-4	139½	18	6-2	174	33	XVI-25	146
4	1-2	180	19	XVI-13	143½	34	11-2	136
5	XVI-5	139	20	6-3	186	35	XVI-26	165
6	2-1	199	21	XVI-14	153½	36	11-3	169½
7	XVI-6	173	22	7-2	200½	37	XVI-28	206
8	2-2	197	23	XVI-16	144½	38	13-1	181½
9	XVI-7	159	24	8-2	174	39	XVI-30	92
10	2-3	163	25	XVI-18	169½	40	15-1	180
11	XVI-8	154	26	8-3	176	41	XVI-31	176
12	5-1	172	27	XVI-19	108	42	15-2	163½
13	XVI-9	153½	28	10-1	193	43	XVI-33	138
14	5-2	176	29	XVI-20	138	44	15-3	164½
15	XVI-11	156½	30	10-2	177			

[a] The ears from the general field are indicated by Roman numerals.

In every case except six the progeny ears of high-yielding parents yielded better than the seed ear planted in the adjacent row on either side. For the entire plat of 1 acre the average increase due to the one year's selection for higher yields is 18 bushels to the acre, or 16 per cent.

The effective results of selection work were brought out by planting hand-pollinated ears from parents having no suckers in comparison with hand-pollinated ears from parents possessing suckers. The result of the work, which was all with the same variety of corn, shows that the progeny of parents possessing suckers had 14½ per cent of suckers, while the progeny of parents possessing no suckers had but 2½ per cent of suckers. To be sure, soil and climatic conditions influence the formation of suckers, but in the test referred to these conditions were the same for both classes, leaving no other cause for the 12 per cent excess of suckers except parentage. It is thought that the tendency to produce lateral buds is hereditary. Conditions of growth may cause such lateral buds to grow into suckers or remain dormant.

To the writer the most encouraging feature of the past ten years' work in corn breeding is the fact that during that time and under conditions existing in various parts of the United States the corn plant has responded to every carefully executed attempt to accomplish a desired end, and the response has been in proportion to the attempt.

CORN BREEDING AND GENERAL FARM OPERATIONS.

Several times the writer has attempted to outline and put into practice methods of corn breeding that would be simple enough in their operation to be generally practiced by farmers and still embrace the principles necessary for satisfactory plant improvement. These attempts, though yielding profitable results, have never been entirely satisfactory, leading to the conclusion that the origination and production of higher yielding types of corn must be a special labor. Our improved breeds of animals have been produced by specialists. The breeds have been multiplied by general stock growers, who have profited by the earlier labors of the breeders. As varying conditions of soil and climate necessitate breeds of corn for various localities, we must of necessity have experienced and skilled corn breeders in each county if we wish to obtain the full possibilities of the plant. Those who grow but a small acreage of corn will find it advisable to purchase their seed from these experienced seed-corn breeders of their localities. Extensive corn growers can, during occasional years, purchase improved seed for multiplying plats and in this way avail themselves of the accomplishments of skilled breeders without the necessity of purchasing each year their entire supply of seed. In localities in which no one is as yet giving the necessary attention to breeding

high-yielding strains it will be advisable for the farmers to maintain seed plats which may be isolated or occupy a portion of the general field.

Corn-growing contests which base the competition upon the profits derived from the crop grown are increasing in interest and embrace the fundamental principles for which corn is grown. Exhibits of a few select ears demonstrate the ability of the individual in picking out perhaps from a comparatively worthless corn a few ears possessing uniformity and fine appearance. A correct record of the profits derived from a certain acreage of corn is the best proof of the excellence of the strain of corn and of the grower's ability along all lines of producing in a profitable way higher yields to the acre.

Good preservation of seed corn can not be discussed, but a neglect of this feature has brought failure to many who expected great yields from pedigreed seed. It should also be remembered that the better the growing conditions the better opportunity heredity has to display its superiority. Our best improved strains of corn, like our best breeds of animals, have become adapted to favorable conditions, and these must be supplied if we are to profit by their improvement. Under extremely difficult conditions of growth teosinte and the buffalo will thrive better than improved types.

CULTURAL METHODS STILL CAPABLE OF IMPROVEMENT.

It has been through lack of space that this article contains nothing regarding methods of producing higher yields by improved methods of culture. We are using methods that are so superior to those of a few decades ago that we have almost ceased to search for better. Present methods, however, are capable of great improvement. For instance, all corn planters and check rowers drop all the kernels of hill-planted corn together in one small space. On a large portion of our rich corn land checking is necessary so that weeds can be controlled by cross-cultivation. Tests completed in 1909 by the Department of Agriculture with different kinds of corn on both fertile and poor soils during wet and dry seasons prove that an increase in yield of 4 per cent is derived by simply spacing the kernels in hill-planted corn so that the stalks stand 5 inches apart in the hills. The yield was not only increased 3¾, 4, and 5 per cent, respectively, in the three tests, but the number of small and poor ears and feeble stalks, largely the result of crowding, was much reduced by the spacing method, which affords each stalk space to develop a strong root system. This demonstrates that millions of bushels can without extra labor be added to our crop by a modification of corn planters so that they will place the several kernels of a hill 5 or more inches apart in each hill.

AGRICULTURE IN THE COAL REGIONS OF SOUTH-WESTERN PENNSYLVANIA.

By H. J. Wilder,
Bureau of Soils.

FEATURES OF THE REGION.

Farming in southwestern Pennsylvania presents many aspects, but among the most striking are the broad range of possible production and the nearness of markets that demand large quantities of food products, from the coarsest to the finest. The intensity of industrial development there—coal mining, together with steel, iron, and other manufacturing industries, based upon cheap coal—so distracts attention from agricultural pursuits that anything pertaining to farming is often scoffed at locally.

In the early days of coal development many farms were sold at a price unhoped for before the coal underlying them began to have a definite value. The price paid at first was only a few dollars per acre more than the farming value of the land at that time, but coal lands have since advanced steadily in price. Other farms were held until the owners believed the coal could no longer increase in value. The few owners of coal lands who have not yet sold, to-day possess a fortune. Those who did sell at the early prices transferred a fortune to the purchasers. In many cases the lands have been resold several times with a good profit at each sale. The natural result has been that farming has declined and in many cases the productivity of the land has been allowed to run down.

It seems surprising, however, that southwestern Pennsylvania is so little known for its agricultural worth and possibilities, and that the general conception of that interesting region is one of mines only and the consequent industrial activity which the vast stores of coal make possible. The fact is that there are several districts of excellent agricultural soils and that there are many more land areas of good agricultural average in the southwestern part of that great State. There is a general impression, founded in part on fact, that farming can not be carried on at a profit where the coke-smoke nuisance prevails, as it does in some parts of this region. Beyond the confines of the soft-coal region itself there is a vague feeling that this condition is serious. This is a problem in itself and is considered later.

The central part of the State is notable because of its ruggedness, as the train carries one westward from Harrisburg, and yet glimpses of narrow, productive valleys, dotted with attractive farm residences, good barns, and other improvements, not only lend marked contrast to the rugged hills and mountains, but suggest that they probably lead to even broader farm areas; and this in many cases they do.

For 116 miles west of First Mountain, near Harrisburg, as measured along the line of the winding railway, to Cresson, the summit of the Allegheny Mountains, there is a steady upgrade. From this point to the Ohio line is a broad plateau, which slopes gradually westward, and lies entirely within the Mississippi basin.

This plateau has been deeply cut by erosion, and many of the highways as well as the railways follow the stream courses. But between the stream courses there are extensive areas of good farm lands, which a half century ago supported a thrifty agriculture, and on which in many districts good farming and thrifty gardening are still to be found.

The presence of coal under large areas in southwestern Pennsylvania, however, has not only caused the tremendous industrial development which has its center in Pittsburg and radiates from that city for considerable distances in all directions, but has likewise determined in large measure the use to which the surface soils are put and the type of agricultural development at present found there. Thousands of acres of soils naturally productive are practically idle, and few farms are maintained at a stage even approaching their normal productivity. So keen has been the interest in mining and industrial development that good lands have been allowed to deteriorate very seriously, not infrequently to the point of abandonment.

Through this region ran the Old National highway, which had a preponderating influence in the settlement of the States directly west of the Ohio River. Passing along this road through good lands in the State of Pennsylvania some of the emigrants tarried by the wayside and helped to build the prosperous agriculture for which the region was noted during the following half century.

The Bureau of Soils of the United States Department of Agriculture made during the summer of 1909 a reconnoissance soil survey of the southwestern counties of Pennsylvania. The total area of these counties is nearly 10,000 square miles.

In some counties, particularly the southwestern four in the State, there are considerable tracts of land, largely of limestone derivation, and now mapped as the Brooke series of soils, which formerly supported a high type of general farming. Large yields of corn, oats, wheat, and grass were obtained. Of these wheat was in part a money crop, but the others were fed on the farm, and the excellence of the fat steers marketed gained for the region an enviable reputa-

tion. The ease with which pastures of Kentucky bluegrass were maintained was an important factor in the low cost and high quality of the beef.

The soil upon which this type of farming became most highly developed was the Brooke clay loam, which occurs principally in Westmoreland, Fayette, and Washington counties, but the Westmoreland silt loam and the Westmoreland loam closely followed. The Brooke soils were all underlain by the Pittsburg vein of coal, the most valuable vein of bituminous coal in the State, and so on these soils farming has become a secondary interest. The Westmoreland soils, however, were underlain by less valuable veins of coal, and hence large farming areas are still available at reasonable prices. These soils are found most extensively in four counties, viz, Westmoreland, southwestern Indiana, and the southern two-thirds of Armstrong and Butler, though smaller areas occur in the counties previously mentioned and also in Beaver County.

INJURY TO VEGETATION BY SMOKE FROM COKING OVENS.

Two legitimate causes appear for the abandonment of some of the good land, which should be clearly understood by anyone from without the district itself who might be attracted there by some of the favorable conditions. Wherever important veins of good coking coal outcrop or lie near enough the surface for profitable working, series of coking ovens, which often extend for several hundred yards, have been built or will be built as soon as the coal is developed. Already long rows of abandoned furnaces mark the depletion of the coal in some localities. In the immediate vicinity of the ovens the gaseous fumes and heavily laden smoke kill all vegetation, and consequently leave a grewsome landscape. So complete is this destruction that not a living thing can grow for as far as the heavy clouds of smoke extend in the direction of the prevailing wind. Results so dire, however, rarely extend for more than one-eighth mile from the furnaces; but within this "dead line" all trees are killed and no grass remains, the ground being bare and unsightly. The smoke follows the surface contours of the locality, and so in many cases is cut off laterally on one or both sides by narrow ridges. Because of these conditions the safe cropping distance from the ovens is variable, but the smoke injury is most marked for an average distance of half a mile. In some cases the winds carry this smoke a long way, the injury far beyond the "dead line" being still so severe that cropping is not generally profitable. Under such circumstances the land is usually left in sod year after year and in many cases used for pasture. In the outer part of the zone around the smoke center, which is more or less influenced, the casual observer

may not notice the presence of a fine soot on the vegetation. If a wisp of grass be drawn through the hand, it will leave the hand sooty. The principal chance for misjudgment by the unsuspecting is near the edge of the zone, where the influence of the seemingly infinitesimal amount of soot on the herbage might appear to be negligible. Experience has shown, however, that cattle will not do their best where even slight amounts of soot are present. Steers may eat a good maintenance ration, but not enough to put on the flesh that these otherwise excellent pastures of Kentucky bluegrass might lead one to expect. This dark side of the situation does not prevail over the whole region, but it has been described in some detail, so that any strangers who think of going there may be guided to the selection of unaffected areas.

SOILS INJURED BY REMOVAL OF COAL NEAR THE SURFACE.

The second legitimate cause leading to the abandonment of some of the good farming lands is the removal of coal veins which lie relatively near the surface. This often causes the surface soils to cave in, and even where this does not occur the soil water disappears so rapidly through the mine shafts that it is impracticable to try to grow crops. Aside from areas so affected, however, there is much land, in fact the greater part of southwestern Pennsylvania, capable of being farmed at a good profit.

OPPORTUNITIES OFFERED BY A GREAT MARKET.

Some grasp of the possibilities of the region may be gained from the fact that to Pittsburg, including the surrounding towns generally spoken of as the Pittsburg district, which combined afford one of the best markets in the United States, tremendous amounts of all kinds of farm produce are shipped in by trainloads from outside the State of Pennsylvania. Much of this produce is grown on soils no better than are found within 50 miles of Pittsburg, yet in the latter region the soils are used largely for growing corn, oats, wheat, and hay, the meadow greatly predominating in acreage.

The opportunity to grow farm products to supply Pittsburg is thus thrown to the winds, as it were, although it is just such a chance as farmers in all well-developed agricultural districts are seeking.

In the future, however, these soils must be utilized along the lines of their special adaptations to take advantage of the local markets, and not in a hit-or-miss way to compete in general agricultural lines with those lands in the Central West and the Mississippi Valley which do not have good markets for special products.

There is no question that the soils of the region are adapted to the production of special crops and products for the large markets.

Their range in character, moreover, renders them adapted to a very wide range of such products. Take the single crop of potatoes, which may be classed as belonging to the intensive system of farming. Soils better adapted to the growth of potatoes are rarely found anywhere, profitable yields of potatoes of unsurpassed quality being easily obtained. The average yield is now low, to be sure, as most average yields are, ranging from 75 to 150 bushels an acre. Yet an illustration of what the soils (in this case the Dekalb silt loam) will do when efficiently handled is furnished by one grower in Cambria County, who in 1909 harvested from 23 acres the remarkable total of approximately 8,000 bushels (7,200 bushels had been dug at the time visit was made, and the owner estimated that those still in the ground would bring the total to about 8,000 bushels).

If more attention were paid to the adaptations of the soils and to their proper management, yields of all the staple crops might be largely increased. But there is a far more striking opportunity in the good prices which the whole Pittsburg district is ready to pay for all sorts of vegetable produce and other high-priced food and animal products, such as the soils of the region are well adapted to produce, yet up to the present time are producing only in small part.

During the progress of the survey referred to a wide range of soils was examined, which represents a similar range of crop adaptation. Excellent corn soils, for instance, are found in considerable area, while other soils in the northeastern part of the region surveyed, particularly the Dekalb loam and the Dekalb silt loam, would be so adapted were it not that their elevated position causes occasional danger from frosts. Good farmers located on some of the good corn soils, such as the Westmoreland loam, the Westmoreland silt loam, and the Brooke clay loam, are able to hold their average yield at 60 bushels of shelled corn to the acre. Better averages, even, are made in exceptional cases, and yet there are soils amounting in the aggregate to thousands of acres which produce from 20 to 30 bushels an acre. It need scarcely be stated that the soils of many such fields are not adapted to corn raising. Neither must the fact be ignored that many fields with good corn soils bring only a low average yield because poorly farmed. Similar conditions in the production of other crops are responsible in great part for keeping average crop yields low, not only in southwestern Pennsylvania but throughout the United States.

Important areas, furthermore, of soils ill adapted to the production of general farm crops are well suited to the growth of the very food products which the most excellent local markets now, in many cases, have to seek elsewhere. This is particularly applicable to the fine sands, the sandy loams, the fine sandy loams, and some of the light silty loams of both the Westmoreland and the Dekalb series of soils.

Of these soils the sandy types mentioned are well adapted to the growth of early and medium garden crops, while the silty loams of the same series are good for later successions of the same crops or for later maturing garden crops. Thus a region which might well be a land of plenty pays tribute first to other crop districts and then to the public carriers for a haul unnecessarily long, while its own soil resources have been sorely neglected.

Development commensurate with the conditions afforded has taken place only in spots. These include areas near towns which produce profitable crops of garden produce, early potatoes, greenhouse crops, etc. A better profit is obtained by retailing or even by wholesaling in the numerous towns than by shipping to Pittsburg. Onions are grown with a fair measure of success, in small plats, but many more could be grown with profit. Cabbages are produced on an extensive scale in some parts of the region, most successfully probably on the silty loams and light silt loams of the Westmoreland and the Dekalb series. The local demand for this vegetable is very large, and an acreage even greater than the present one should be planted. So it is with the vegetable foods of all seasons of the year.

The range of market demands is broad. The number of wealthy families is sufficient to create one of the finest markets in the world for distinctly high-class food products. The multitude of mine workers and other industrial laborers require enormous quantities of staple food products for which they pay good prices, while a part of this class consume relatively large quantities of some of the coarser and cheaper materials. This does not mean that there is demand for inferior or unsuitable foods in the vegetable line, but that large quantities of wholesome vegetables are consumed with the less expensive cuts of meat. In other words, the workingman of this region always works intensely, and hence requires a good diet, consisting largely of the coarser yet nourishing foods, and whenever there is work he has the money to pay for such food materials, and is ready to do it.

Thus there is strong demand for a variety of crops which a corresponding variety of soils in the region is amply adapted to produce. When it is realized that it is impossible to conceive under existing conditions—industrial, labor, etc.—that this demand can be locally supplied for a good many years to come, some idea may be had of the wonderful opportunities for agricultural development in this region. But such development can not proceed in a way at all commensurate with the possibilities unless advantage is taken of natural conditions.

The first of these conditions to consider is the suitability of particular kinds of soils for particular crops, especially for crops of high market value. It is commonly believed, for example, that the highest average yields of onions are obtained on muck soils. Onions

grown on muck soils, however, are poorer in quality than those grown on very rich fine sandy loams or silty loams, soils which with efficient management will bring highly satisfactory yields. On the other hand, muck soils produce not only larger yields of celery than other soils, but the celery is of the finest quality. Onions may be very successfully grown on selected areas of the heavy fine sandy loams or the light silty loams of the Westmoreland and Dekalb series.

Similar attention must be paid to the adaptation of the many kinds of soils in southwestern Pennsylvania, both to special crops of high money return and also to general farm crops, for without such grasp of soil adaptation, results in full measure will not be obtained.

CROP ADAPTATIONS OF THE SOILS IN THE BROOKE SERIES.

Among the soils encountered, the Brooke clay loam is exceedingly well adapted to dairying, and there is almost unlimited demand for milk and cream. In locations too remote from market for the sale of these products, a fancy grade of dairy butter can be sold at a good profit in surrounding towns and mining villages.

A most favorable point for the dairyman on Brooke clay loam is the marked success with which clover can be grown on that soil, thus furnishing a large supply of home-grown protein. This soil in return, too, receives perhaps as near the maximum amount of benefit as is often attained from a clover crop, in that its structure is improved to a marked extent, in addition to the benefit derived from the increased supply of nitrogen. "Limestone land" is the most common local name for the Brooke clay loam. It all lies to the west of Laurel-Chestnut Ridge, and usually occurs in alternating strips with the Westmoreland soils. The largest areas of this soil are in Fayette County, but it is also an important type in the southwestern part of Westmoreland County and the northern part of Washington County. In Greene County the Brooke clay loam occurs only in local areas. The soils are derived from a series of layers of limestone and shale which have been tilted enough in places to expose alternate edges of these two kinds of rock. Where the layers are nearly horizontal, some of the upper ones have been entirely decomposed, leaving a soil débris at present overlying either the limestone or the shale, as the case may be. The limestones weather into red soils and the shales into brown soils, thus giving a newly plowed field a strikingly mottled appearance. For this reason these soils are often called locally the "red limestone lands," and they are easily recognized. The limestones predominate over the shales in the formation of the Brooke series. The deepest red soil is a heavy clay of such structure that careful tillage is required to prevent clodding and to keep it in good mechanical condition. The brown soil spots are most commonly silt loam, or silty loam, and are not difficult to work.

The more mixed these materials become during the processes of tillage, the better. The subsoils are clays or clay loams, which maintain good moisture conditions for growing crops. The most extensive of the limestone types of soil is the clay loam.

The Westmoreland loam, the Westmoreland silt loam, the Dekalb silt loam, the Dekalb loam, and the Dekalb clay loam may all be used to advantage for dairying purposes. All dairying operations must be conducted under modern approved methods, however, as "average" dairying can no longer be made to pay with the present price for labor. The Dekalb soils occur principally in Jefferson and Clarion, and in northern Indiana and Armstrong counties.

Hay is a good money crop on all the soils mentioned as adapted to dairying, and can be used as such to advantage either in combination with dairying or as a special crop where dairying for any reason is not desired. For clean hay of good quality there is ready local sale. To solve the labor problem in part, and also to feed the hay on the farm and thus retain more fertility, colts can be grown by crossing good farm mares with thoroughbred stallions of some one of the draft breeds. A plan even better, for the occasional man qualified to carry it out, is to have one or more thoroughbred draft mares from which to breed.

ADAPTATIONS OF THE SOILS IN THE WESTMORELAND SERIES.

The Westmoreland soils predominate in Greene, Beaver, and Allegheny counties, are associated with the Brooke soils in Fayette, Westmoreland, and Washington counties, and extend also into southwest Indiana and southern Armstrong and Butler counties. In Allegheny County the topography is so broken because of the confluence there of the principal regional rivers, mining and industrial development have been and are now so great, and so much of the county is in demand for residential purposes, that the agricultural use of soils is relatively insignificant; but this does not apply to the other counties. The Westmoreland loam consists of a brown loam to an average depth of 8 inches, which is underlain by a light brown or dark yellow silty clay loam, or heavy silt loam. The Westmoreland silt loam consists of brown silt loam from 6 to 10 inches deep, overlying yellow silty clay loam. These two soil types occur in reasonably level and gently rolling areas in the western half of Fayette County and in the eastern part of Greene County, also in the vicinity of Washington, Mount Pleasant, Greensburg, Indiana, Cochran Mills, Elderton, Elders Ridge, Kittanning, Butler, Harmony, Mars, and Evans City, and in the Conoquenessing and Ligonier valleys. Small areas occur west of Beaver Falls, as do also important areas of the Westmoreland fine sandy loam. The latter type is used there largely for trucking. The surface soil is a yellow to dark brown fine sandy loam 6 to 9 inches deep. This rests upon a yellow or brown fine sandy loam

which becomes heavier with depth, and grades into a fine sandy clay or a clay loam at an average depth of 18 inches. This type should not be confused with the Westmoreland fine sand, which has a similar surface appearance, but is underlain by a yellow or brown fine sand. The latter type will produce garden crops a little earlier, which on that account may bring a higher price in market, but for later truck and potatoes the fine sand is less desirable, as it does not equal the fine sandy loam in yield and is more susceptible to injury from drought.

ADAPTATIONS OF THE SOILS IN THE DEKALB SERIES.

The Dekalb soils lie in a broad belt north of the Westmoreland soils, and not only include the four counties previously mentioned, but also stretch northward to the glacial line which marks the southern boundary of the Volusia soils in the northern part of Pennsylvania and in southern New York. Laurel Hill and Laurel-Chestnut Ridge have also been mapped as the Dekalb soils. On these and other ridges and hills within the Dekalb region the soils are, as a rule, sandy, shallow, stony, and rough, though smooth patches of sandy soils often occur. Aside from these relatively small and smooth areas these ridges should be left in forest. On the broad rolling Dekalb uplands farms are usually found in little clusters of three to a dozen. Farm lands thus occupied support thrifty little communities which are separated from each other by local broken areas. The streams in this region characteristically cut V-shaped valleys, the sides of which are so steep that they are most often left in forest, though some afford good pasturage. In many sections these rough areas occupy no more than 20 per cent of the ground, but in others they are much more extensive. Banks and Montgomery townships in northeastern Indiana County, for example, illustrate the condition of farm lands in one of the hilly sections where the soils are of good average productivity. Local inquiry leads to the statement that these are good farming townships, and parts of them are, but there is also a high percentage of rough and steep land adapted to forestry only. In fact, a succession of lofty knobs, frequently steep sided, but again with smooth shoulders, affording favorable locations for farms, gives the key to the topographic character of the region. Again, in the southwestern part of the county, Armstrong, Young, and the western part of White and Center townships comprise a good farming region. On the gently rolling areas between the creek courses the soils are mostly the silt loam and a silty phase of the Dekalb loam, but the steeper hills and the tops of the local knobs are often Dekalb fine sandy loam. The two classes of topography described and the soils associated with them are, broadly speaking, representative for the Dekalb region of Jefferson, Clarion, and Armstrong counties, as well as Indiana County. Such soils when found

in farms which it would be practicable to buy range in price from $30 to $75 an acre, the latter price being for favorable location. Farms of 100 to 200 acres, with good soils and well improved, may be secured at from $40 to $60 an acre at a distance of 3 or 4 miles from towns of 1,000 to 5,000 inhabitants. The rough lands and farms from 5 to 10 miles from town range in price from $10 to $40 an acre.

Tree fruits can be grown with success in many parts of the area under proper conditions. But there are certain topographic districts, some kinds of soils, and one artificial condition which should be carefully avoided.

The artificial condition referred to is the coke smoke, which near the ovens destroys all vegetation. The effect of the smoke at greater distances from the active coke ovens is perhaps even more serious. Carried by the winds, soot is deposited on the fruit and other crops, greatly injuring them. Hence no orchards should be planted near any coal openings or where the more valuable coal veins occur, as the eventual damage to annual crops when the coke is burned will be much less than with orchards. For the latter the risk is too great.

The elevation of the Allegheny Plateau is high, much of it approximating 2,000 feet above sea level. The prevailing winds come from the southwest, and the westerly slope of the plateau gives them full sweep across the highest level of the whole region. The winds are strong and when accompanied by severe storms of sleet are so injurious to fruit trees that orcharding is feasible only in protected locations. High winds, too, at picking time, or a little earlier, sometimes bring disastrous results on exposed locations in the loss from fruit blown from the trees. Areas protected from such fortuitous contingencies occur, but in their selection the opposite topographic extreme must likewise be avoided, for the V-shaped little valleys which are characteristic of the region are unsafe on account of danger from unseasonable frosts. Fortunately these unfavorable conditions may be avoided. The upper slopes of these valleys, local elevations within them, and more extensive areas on slopes and rounded hills nearly up to the plateau level are sufficient in extent for the development of an important orchard industry. For this purpose the Westmoreland loam, clay loam, and fine sandy loam are well adapted, as are also selected areas of the loam, silt loam, and clay loam of the Dekalb series.

HOW THE SOILS MAY BE IMPROVED.

Without going into great detail, three plans of soil improvement may be suggested as being generally applicable to the region as a whole. Because of inadequate farming systems extending over a period of years, many soil areas have become acid. Soils in an acid condition will seldom yield profitable crops. Lime is easily obtained by burning at home in many cases or from a local kiln, and where a

local supply is not available it is still cheap because long shipments are unnecessary in this region. Thus the farmer of southwestern Pennsylvania has a very important advantage over competitors in many other farming regions because of a cheap supply of lime with which to overcome soil acidity, and to keep his soil in a friable condition.

The second plan of soil improvement, and that a matter of the utmost importance, is to increase the humus content of the soil by the use of more stable manure, or by growing more leguminous crops, of which the red and alsike clovers are by far the most important for the locality under consideration. One of the principal causes of the frequent failures with clover has been soil acidity, a condition which may be economically overcome throughout the region, as above suggested, and when this has been accomplished a good start will have been made toward a marked increase in crop returns. Alfalfa, the best legume of all when grown under ideal conditions, may be successfully grown in this area. For it the Westmoreland soils are generally the best, though not as good as the Brooke soils where the more loamy parts of the latter have been made so mellow by a large supply of humus that they do not suffer at all from winter injury by heaving. If brought to a state of high productivity the Dekalb loam and the Dekalb silt loam, where deep and well drained, should also bring fairly good returns from this crop.

The third plan which would lead to larger crop yields and an improved farm practice is a system of crop rotations suited to the needs of farmers growing different money crops. The good old rotation of corn, oats, wheat, and grass—and there is no general rotation better on the heavy soils in the Brooke, Westmoreland, and Dekalb series—seems to be out of place in its present use on some of the light soils and under existing cropping methods. In reply to a direct question many farmers are unable to give any reason for growing a crop of oats, for instance, except that it is a historical member of the above long-established rotation, and yet they complain that the crop no longer pays. In such cases the elimination of one of the small grains would be of decided benefit, and would still leave the opportunity to seed with the small grain crop retained. The practice of holding land in sod as long as possible is too prevalent, the farmer taking an unsafe risk in the hope that one more paying crop may be secured, a hope in which he is very often disappointed. Losses of this kind cause in the aggregate a serious decrease in the wealth which the soils might produce. When timothy is grown as a money crop on the Westmoreland and the Dekalb soils it is recommended that the first year's crop of clover mixed with timothy be fed on the farm, and that the pure timothy be sold the following year only from any one field, which should then be plowed again for corn. The fact,

however, that the Brooke clay loam is much more difficult to work than the above-mentioned soils, and also that it is a stronger soil, makes it feasible to leave it in timothy for two years by allowing the rotation to run one year longer.

All of these suggestions are based on the assumption that the sod is not top-dressed, because that is an unusual practice, though it could be practiced to advantage, particularly on the heavy Brooke soils and to some extent on the heavy soils in the Westmoreland and the Dekalb series. In this way it would be practicable to leave the land in sod for a longer term of years, a plan not only frequently desirable, but almost a necessity on fields affected to any great extent by coke smoke. This is owing to the difficulty or even the impossibility of securing a successful reseeding where there is very much smoke from the soft-coal furnaces.

The necessity for at least occasional rotation in growing the money crops is not often realized anywhere within the limits of the area surveyed. A striking local illustration of the necessity of this is afforded, nevertheless, by the greatly decreased returns in some instances from cabbage, which is one of the most important special money crops of the entire area. It is believed, furthermore, that similar intensity of cultivation with many other gardening crops will result at least in decreased yields.

It is fully realized that a certain loss of time often results from bringing land which has been used for the common extensive farm crops into the best condition for certain special crops, and that this fact, together with a restricted acreage, in some cases is largely responsible for holding soil areas in some special crop as long as possible. Cropping experience has abundantly proved, however, that even in such cases a frequent change is necessary from the fact that it leads to a larger net profit from the soils.

SUMMARY.

In brief, then, there are important soil areas in western Pennsylvania which by their differences in character are well adapted to the production of an extensive range of products fitted to supply the large demands of the local markets. A comprehensive use of the soils of the region to supply these markets in accordance with the adaptations of the different kinds of soils to the various crops for which there is such ready sale offers an opportunity seldom surpassed.

Eventually the soils of the region will be brought toward their normal productive capacity. Such growth will be slow as compared to the rapidity with which coal is being taken from the ground, but it will be certain, and the attendant profits, while not leading to great wealth, will look attractive to the great number of farmers that must, in the not far distant future, constitute an important factor in the population and financial production of the region.

THE OPPORTUNITIES IN FOREST PLANTING FOR THE FARMER.

By Allen S. Peck,
Assistant Chief of Operation, District 3, Forest Service.

THE FOREST AND THE FARM.

Forestry is but one of the forms of crop production included under agriculture. The woodlot is an integral part of the farm and an essential factor in its success. Forest planting is that part of forestry which seeks to restock and perpetuate desirable timber and to establish new forests on treeless areas, where they are needed for protective or other purposes. Forest planting should not be confused with tree planting or arboriculture, for these terms cover only the planting and care of trees chiefly for ornamental purposes, while forest planting indicates the planting of trees in stands of considerable size, in which forest conditions are sought.

In the farming districts of the East, where almost every farmer has preserved a small bit of the original forest, which he calls his woodlot, there is very general lack of appreciation of the necessity for utilizing these woodlots to the best advantage, and of the methods by which this may be accomplished. Much may be done by management, which consists largely in careful cutting that will keep the forest cover intact, and in removing dead and dying and inferior trees. Planting, however, is very generally needed in order to hasten the restocking of woodlots with valuable species. One of the fundamental principles of forestry is that the trees in a stand must be sufficiently close together to be mutually helpful; that is, that their crowns must form a continuous cover to shade the ground and the tree trunks, in order that side branches may be self-pruned and the trees be forced into straight upward growth. Where there are open spaces they should be planted, and where it is desirable to cut a portion of a woodlot clean much time can be saved by planting instead of waiting for natural reproduction. On many farms the tract now occupied by the woodlot would be more valuable for crops, while on the same farm there may be an irregular plat of land or a piece of worn-out or rocky land upon which it would be wise to plant trees. Planting is also valuable to check erosion, or soil washing.

In general, forest planting in the United States needs to be modified, as shown on the accompanying map (fig. 17), according to an eastern, a central treeless, and a western region.

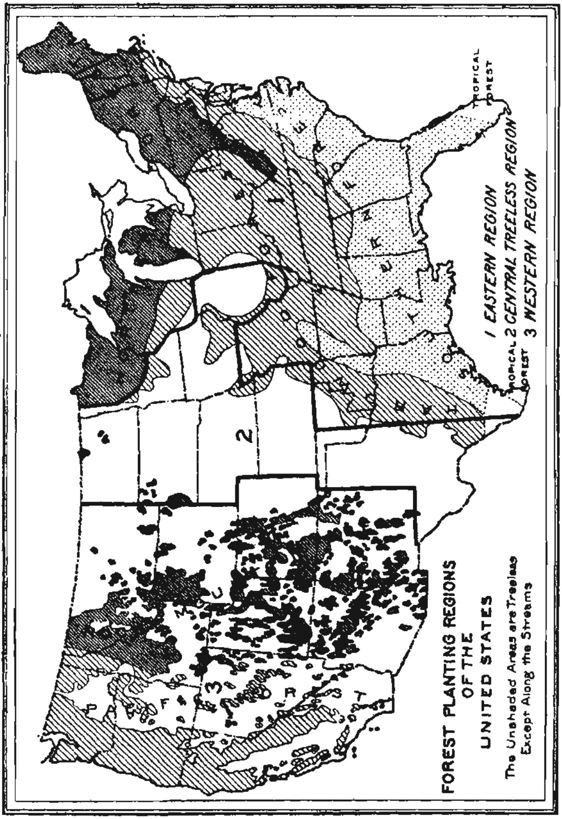


FIG. 17.—Forest planting regions of the United States.

EASTERN REGION.

The eastern region includes all of the country east of the prairie States. This region in turn subdivides naturally into three parts, the northern spruce and pine forest, the southern pine forest, and the

big central hardwood belt. Of the two broad purposes of forest planting, commercial and protective, the first is most important throughout the eastern region, though in many localities protective planting is of chief interest to the farmer. Nearly 35,000,000 acres in the East should be planted. Of these 18,000,000 are in the northern States, 12,000,000 in the central hardwood region, and the rest in the Gulf and South Atlantic States.

The lands which offer opportunities for planting may be classified into (1) cut-over burned lands, not fitted for agriculture, which are not restocking naturally with commercially valuable species; (2) forest lands originally cleared for agriculture which have since proven unsuitable for this purpose; and (3) farm woodlots. Lands of the first class are for the most part owned by large corporations or by the States and do not greatly concern the farmer. They are chiefly in the northeastern and lake States, where extensive areas which once bore stands of spruce and pine have been so thoroughly denuded by ax and fire that no hope of natural restocking remains.

The abandoned farms of southern New England are striking examples of the second class, as are also the lands in the southern Appalachians, once cleared for farming but now ruined by erosion. Throughout the East farm woodlots have so deteriorated that planting is needed in order to restore them to their highest productive capacity; also on many farms there are tracts which are now lying idle or are being cultivated at a small return, but which would furnish splendid investments if devoted to tree growing.

The area of plantations already made in the eastern region is nearly 93,000 acres, and 85,000 acres of this are about equally divided between the northern tier of States and the central hardwood region.

Forest planting requires a considerable initial investment, and the cost is relatively higher than that required to start any other form of forest work. Therefore protection to the investment is of the utmost importance, and fire is the source of loss most to be guarded against. Other things that must be taken into consideration are cheap land, a good market, a minimum initial cost, and a low rate of taxation. The influence of each of these will vary with the locality and the purpose of planting; for instance, if a windbreak is needed to protect stock, crops, or farm buildings, then the rate of taxation, the market, and even the cost of planting will carry comparatively little weight.

NORTHERN FOREST.

Leaving out those planting problems which are of such magnitude that they must be handled by the State or by large companies, the farmer's part, in the northern forest, will be confined to the restocking of farm woodlots in the various agricultural districts and to the reforesting of abandoned farm lands in New England.

The New England landowner is realizing more and more the fact that although portions of his farm may be "run out" or too rocky to compete with the better agricultural land of the West in the production of annual crops, yet they offer a splendid opportunity for a very safe and satisfactory investment in timber growing, and wherever the farm includes sufficient good agricultural land to furnish the necessary annual income, the remainder should, by all means, be devoted to a forest crop.

Aside from extensive pitch pine plantations on the sandy areas of the Cape territory of Massachusetts and the islands of Marthas Vineyard and Nantucket, more than 90 per cent of the planting in New England has been with white pine. Other conifers which under suitable conditions have been successful are Norway spruce and European larch. Mature plantations of hardwood are comparatively rare.

The state governments of Connecticut, Massachusetts, and Vermont distributed about 1,500,000 seedlings in 1908, and these did not supply the demand. One private firm disposed of a million seedlings. Beginning with the spring of 1907, the state nursery of Vermont started in to distribute about 100,000 seedlings a year. Almost every farmer in Vermont may wisely do a certain amount of planting under the direction of the state officials. The most hopeful places for beginning the practice of forestry are the old, weedy back pastures which are now lying waste. Next in importance to these come the blank spaces in natural stands, which should be filled in.

White pine is considered the best, though red pine is of great value, especially for the drier soils, and the Vermont experiment station is using Scotch pine on dry sands. Norway spruce is of especial promise for the moist, strong land of the high mountain valleys—natural spruce land. Small plantations of black locust are being tried for supplying durable posts and stakes.

The conifers best adapted for planting, particularly on the sand plains, are Scotch pine, white pine, Norway pine, and pitch pine; and the hardwoods which promise best are chestnut, red oak, locust, and sugar maple. (See Pl. XXII, fig. 1.)

The increasing field for forest planting in the New England States is strikingly indicated by the recent increase in the area of unimproved land in farms. There was 11 per cent less improved farm land in Maine in 1900 than there was in 1890, and 20 per cent less in New Hampshire, with the other New England States between these two figures. In all, there are 2,500,000 acres in New England that need planting.

In New York State the species which are best adapted and which promise highest returns are white pine, red pine, Norway spruce, chestnut, red oak, basswood, tulip poplar, white ash, and, in moist places, Carolina poplar. Forest planting is increasing rapidly. The

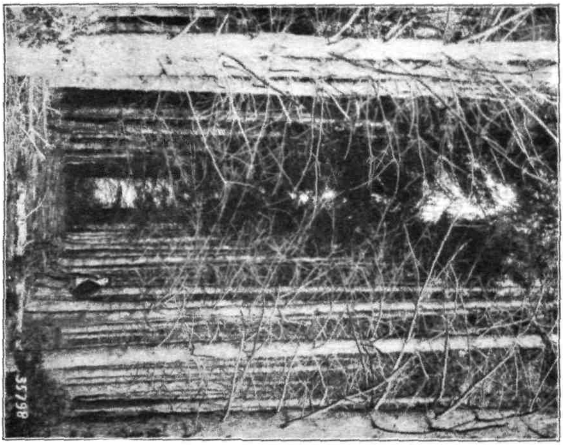


FIG. 1.—INTERIOR OF A 50-YEAR-OLD WHITE PINE PLANTATION NEAR BRIDGEWATER, MASS.

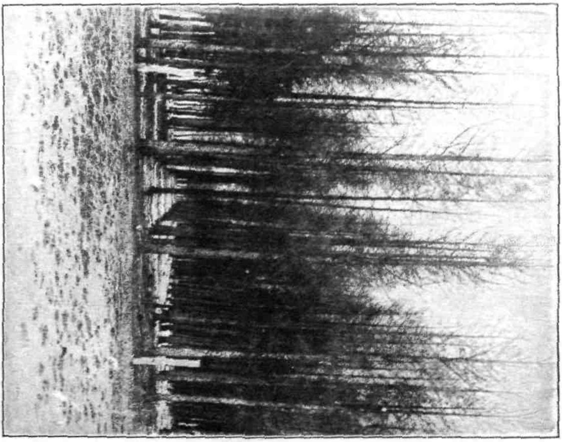
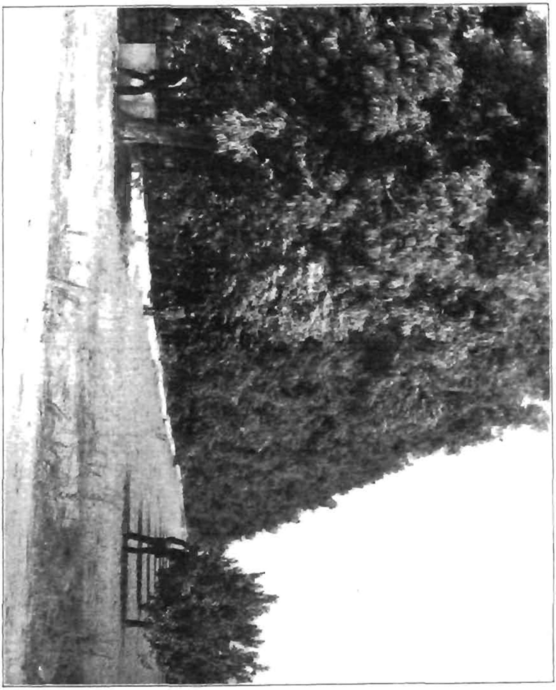


FIG. 2.—A 27-YEAR-OLD EUROPEAN LARCH PLANTATION, DUNDEE COUNTY, ILL.

FIG. 1.—A 20-YEAR-OLD BLACK WALNUT PLANTATION FROM SEED, TIPPECANOE COUNTY, IND.

FIG. 2.—A 3-YEAR-OLD PLANTATION OF BLACK LOCUST ON IRRIGATED LAND NEAR TWIN FALLS, IDAHO.

PLANTATION OF HARDY CATALPA, RENO COUNTY, KANS.



EUCALYPTUS WINDBREAK TO PROTECT A LEMON ORCHARD, SAN BERNARDINO COUNTY, CAL.

work of the State in the Adirondacks is a remarkably fine example of good nursery practice and planting, and active steps are being taken by the state authorities to encourage forestry among the farmers and other landowners.

Pennsylvania divides readily into three sections where conditions of surface, soil, and climate are greatly enough differentiated to modify the practice of planting for each. The southeastern plain extends from tidewater along the Delaware westward and northeastward along the Blue Mountains, which form the northern boundary of Cumberland, Lebanon, Berks, Lehigh, and Northampton counties. The central mountains comprise a broad belt extending from the northeastern part of the State southwest to Maryland and West Virginia. The western hills include a section in the northwestern part of the State extending from the Allegheny River westward to the Ohio line and Lake Erie. The second-named region was covered originally with splendid forests of pine, hemlock, and hardwoods. There is relatively little need for planting in this region, so the greatest opportunities for farm forestry are in the other two sections.

The southeastern plain was an early settled farming region, and nearly every farm had its woodlot. Very few of these woodlots are now in good condition, though in some cases the owners have become interested in reforestation, and more or less tree planting has followed. The average prices of cordwood, fence posts, and farm repair material are higher in this than in any other portion of the State. This fact, coupled with the value of the land for agriculture, makes this region a splendid field for farm planting where quick-growing species will produce fence posts and other timber in a comparatively short time. Though more planting has been done in this section of the State than in any other, the early purposes of planting were rather vague. Two kinds of timber were planted. Of these white pine leads in the class of slow growers and black locust of the rapid growers. No great degree of success has been attained and the value of the early planting has been mainly educational. The great area of the near-by central mountain region, which is more valuable for trees than for any other crop, makes it desirable to devote woodlots on these plains to rapid-growing species. Those which seem to give the best promise are red oak, European larch, tulip poplar, and, where preservative treatment can be given, cottonwood, silver maple, white willow, loblolly pine, and pitch pine. Catalpa has proven successful enough to justify its limited use on rich soils, and with proper methods of growth it should prove a valuable post tree.

Where planting is needed in the central mountains the species used should be white pine and spruce, and hardwoods such as red and scarlet oaks, tulip poplar, white ash, and basswood.

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The western hills section ranks next to the southeastern plains in agricultural value, yet contains a much larger proportion of land adapted to trees. Here planting will add to the general value both of the farm and forest areas. Since there are considerable areas of essentially nonagricultural land separating the agricultural sections, slower-growing species for the production of large timbers will be profitable, while, as on the southeastern plains, quick-growing species may be planted to advantage on many of the farms. Thus far, however, very little planting has been done. In the western hills the soil is admirably adapted to white pine, European larch, and hardwoods such as red, yellow, and scarlet oaks, white ash, basswood, honey locust, and rapid-growing species such as cottonwood, soft maple, and white willow, to be used in connection with preservatives.

In New Jersey forest planting is rapidly increasing. For timber production the species which have been chiefly planted are white pine, Scotch pine, white ash, and white elm, though species which give the best promise are the rapid-growing pines and spruces.

In the Lake States, which have a southern hardwood forest and a northern coniferous forest, forest planting is rapidly increasing. The principal species which have been planted are white pine, Scotch pine, Norway pine, European larch, and, to some extent, the more rapid growing hardwoods such as locust, catalpa, black walnut, cottonwood, ash, and elm. As in the East, woodlots are deteriorating and require interplanting. Excellent trees for this purpose are the white pine, the Scotch and Austrian pines, and the Norway spruce. The rapid-growing hardwoods which make such an excellent investment farther south can not be successfully grown in this northern region.

HARDWOOD FOREST.

In the States included within the great central hardwood forest region the sort of planting which should chiefly interest farmers will have for its object the utilization of waste land on the farm.

In those States which are making the most rapid general progress the state authorities are issuing publications that contain advice and information, are distributing stock from state nurseries, and are conducting forest work on state lands, which serve as an object lesson to private landowners. In the farming region east of the Appalachians in Virginia, Maryland, and Delaware most of the land is too valuable for agricultural purposes to be devoted to timber growing. As in other farming regions, however, every farm should have its woodlot, and in many localities where no extensive timbered areas remain the planting of windbreaks and shelterbelts is advisable. A recent study of conditions in Delaware indicates that the growing of timber crops, without considering the value of forest belts from a protective stand-

point, is an excellent investment on lands worth not more than $15 per acre. Portions of farms which have been worn out through continued cultivation may be planted to advantage. The species recommended for planting in Delaware are chestnut, red and pin oak, tulip poplar, and black locust. The last-named tree will do well on sandy soils not only in Delaware, but throughout Maryland and Virginia. There is one drawback, however, to a locust plantation, and that is its well-known enemy, the locust borer, which is greatly to be feared in many localities. Where it is prevalent it is useless to plant locust. Another rapid-growing tree which is likely to prove of considerable commercial value when planted on fertile, fairly heavy, well-drained soils in the more northern portion of the State is the hardy catalpa. Excellent trees for windbreak and roadside planting are the European larch and black locust.

Except for the early planting in New England, the farmers of Ohio and Indiana have been the first to recognize the value and importance of forest planting. There are a number of rapid-growing broadleaf species adapted to this section which give early returns and which have been exploited by commercial nurserymen. In these two States and generally throughout the central valley district the practice has been to plant rapid-growing kinds. For example, in West Virginia and southwestern Pennsylvania, walnut, locust, sugar maple, red oak, chestnut, and catalpa have been planted for posts, mine props, and timber; in Ohio, black locust and catalpa for posts; in Indiana, black locust, catalpa, and walnut; in Kentucky, black locust, catalpa, tulip poplar, maple, and walnut, principally for mining timbers and posts; in Tennessee, locust, maple, and cedar; in Missouri, catalpa, locust, walnut, osage orange, cottonwood; in Arkansas, locust and walnut.

While black locust and hardy catalpa give excellent returns when planted under proper conditions, the most far-reaching and valuable result of the planting of these species has been to call attention to forestry and stimulate general interest in the growing of timber crops. Our present knowledge of conditions shows that without doubt the planting of other and more slow-growing species is fully justified from an economic standpoint. The state authorities of Indiana and Ohio are taking a leading part in promoting farm planting. Along the Ohio River in southern Indiana and Ohio there is much land now being farmed which would actually produce a higher return per acre if planted with black locust, or even with some of the slower-growing but more valuable hardwoods. Nowhere in the United States can there be found a more striking example of the need of timber belts for securing the highest results from agriculture even where there is scarcely an acre of waste land on any farm. Throughout this district every farmer should make provision for the future by renewing his

woodlot, by planting where necessary, and should see to it that sufficient shelterbelts are planted to insure future protection to his homestead, his growing crops, and his orchards.

SOUTHERN FOREST.

Of the total area of cut-over forest land which is not restocking naturally, about 70 per cent will reproduce pine if it is protected from fire. About 30 per cent, therefore, or more than 5,000,000 acres, will require artificial restocking. While most of this lies within the southern pine forest, there are limited opportunities for planting in the Appalachian Mountain region and in the northern portions of Georgia, Alabama, and Mississippi. Planting thus far has been almost altogether with rapid-growing hardwoods, such as catalpa, and for the most part has been ill advised, and serves as no indication whatever of the lines along which planting should progress, since hardy catalpa is unsuited to this regiou. For quick returns of small-sized material, black locust is especially suited to the mountain and Piedmont sections of Georgia, and white oak is good for posts and ties, though for posts it will be best to grow loblolly pine and treat it with preservatives. Carolina poplar grows rapidly in the South and makes good chemical pulp; but since it has been found that pine can be used for pulp, the value of planting poplar is somewhat doubtful.

In general, however, planting is unnecessary throughout this region, because reproduction is abundant wherever there is protection from fire.

CENTRAL TREELESS REGION.

The central treeless region includes the States of Illinois, Iowa, North Dakota, South Dakota, Nebraska, and Kansas, the prairie district of Minnesota, and the portions of Oklahoma and Texas lying west of the hardwood belt.

Forest planting has been a part of the progress in agriculture and therefore has been most extensive in the region of best agricultural development. Nebraska and Kansas lead in the acreage of plantations. About 840,000 acres have been planted within this central region, but there should be more than 14,000,000 acres.

As in the past, planting in this region will be almost entirely a private enterprise, carried on in connection with farming. While protection is, and in general will be, the primary object, planting should be done from the commercial standpoint, since by using only profitable species it will easily be possible to secure the double advantages of shelter and ornament, and at the same time to derive a revenue from all the plantations. (See Pl. XXII, fig. 2; Pl. XXIII, fig. 1; Pl. XXIV.)

Until quite recently forest planting had declined or was at a standstill in the older farming regions of Illinois, Iowa, Nebraska, and Kansas, and the cutting of mature plantations offset the new planting that was being done. Shelterbelts are increasing in the newer farming districts of the Dakotas and Oklahoma, and, owing to their evident value to plantations, interest in planting is now being revived. This growth in interest is shown by figures from forty-five of the principal commercial nurseries which handle forest-tree seedlings. In 1906 they sent out 24,530,929 young trees; in 1907, 38,540,202; and in 1908, 40,791,193. Seventy per cent of these trees were hardwoods and 30 per cent conifers.

The advantage and the necessity of having a certain proportion of the land in agricultural districts under forest cover have been clearly demonstrated; 5 per cent of the prairie region should be forested, and farther west on the plains 3 per cent may very well be devoted to tree growing.

The Forest Service of the Department of Agriculture is prepared to render practical assistance to farmers and tree planters, and since the opportunities have been foremost in the treeless States, the first efforts of the Forest Service were directed toward this region. There has been a wide distribution of literature in these States, and for several years Kansas and Nebraska have received more of the Forest Service literature than any other States.

In Illinois planting is no longer being practiced so extensively as in the past. The total area planted by the farmers of this State is somewhat more than 15,000 acres, but the areas which might very properly be devoted to tree growing aggregate some 1,500,000 acres. The species chiefly used have been black walnut and hardy catalpa.

Probably 125,000 acres have been devoted to timber growing on the farms of Iowa. This is but a small fraction of the 2,000,000 acres which should be planted in order to keep the proper balance between cultivated land and woodland, and here again forest planting seems to be on the wane. Species which have been planted chiefly are, in the order of their predominance, silver maple, black walnut, cottonwood, boxelder, willow, ash, elm, and catalpa.

In the western and southern prairie portions of Minnesota it is estimated that there are nearly 1,200,000 acres which should be planted. There have already been planted about 115,000 acres, and there is now a slight increase in the extent of planting. The species which are most commonly planted are boxelder, cottonwood, maple, willow, ash, and elm.

In North Dakota more than 1,500,000 acres could very properly be planted with forest trees, in addition to the 52,000 acres which it is estimated have thus far been devoted to this purpose. It is interesting to note that in general throughout the entire State, which is a

relatively new farming region, tree planting is rapidly on the increase, chiefly for shelter and for post production. The species mainly used are boxelder, cottonwood, green ash, and willow.

About 122,000 acres have thus far been planted in South Dakota, and at least 1,600,000 acres should be planted by farmers. As in North Dakota, the interest in tree planting is growing, and, in addition to the species which have been most popular in North Dakota, elm and soft maple have been used extensively in South Dakota.

Nebraska has an area of planted timber estimated to be 192,000 acres, and there are something more than 2,000,000 acres more which might be planted to advantage to utilize waste lands and provide adequate protection for crops in the farming districts. While Nebraska has deserved and won the name of "Tree Planting State," the indications are that planting is slightly declining, particularly in the eastern portion of the State. As in the other Western States, the chief purposes of past planting have been to secure shelter and to produce fuel and posts. Cottonwood, boxelder, ash, elm, and maple have been the species largely planted. Reliable data show that 175,000 acres have been planted with forest trees in Kansas, and at least 1,700,000 acres should be planted. In addition to the hardy species which have been most largely used in Nebraska, black locust, hardy catalpa, and black walnut have been favorites with the Kansas farmers.

In the prairie region of western Oklahoma over 21,000 acres have thus far been planted with trees. It remains for the landowners in this relatively new farming region to plant nearly 300,000 acres for the best interests of their section. The species chiefly used are black locust, hardy catalpa, maple, and cottonwood.

The planting of black locust, cottonwood, and catalpa is also being done on a rapidly increasing scale on the prairies and plains of the western half of Texas. Hardly more than 13,000 acres have, however, as yet been planted, and it will probably be many years before the ranchmen in this region will accomplish the planting of the 2,500,000 acres which should be devoted to tree growing.

As a whole, particularly for shelterbelts and windbreaks, the central region needs to use more conifers.

WESTERN REGION.

The western region includes the Rocky Mountain and the Pacific Coast States. Much of the forest land in the Western States is within National Forests, and forest planting on these lands is chiefly a federal problem. But there are abundant opportunities for private planting in the valleys of southern California and on irrigated lands throughout the region. It is essential that more than 2,500,000 acres of land in this region in private ownership should be artificially

forested, and by far the greater portion of this planting must be done by farmers or ranchmen.

On irrigated lands the primary purpose of planting by private owners is identical with that in the central treeless region. Most of the irrigation projects are subject to strong winds, and protection is essential. Forest planting by farmers in California is needed for the protection of watersheds, as shelterbelts for orchards, and for the production of commercial timber.

The area of planted timber in this region is 38,862 acres, of which 37,100 acres have been planted by private landowners. A very interesting and economically valuable object lesson in planting is the aggregate of 20,000 acres of eucalypts in California. This presents a remarkable example of profitable returns from a quick-growing species, and shows the value of further experiments with exotic species in the United States.

If proper species are used there should be no great difficulty in securing good shelterbelts and woodlots on western irrigated lands. Eastern trees have proved most useful in the limited planting done thus far. Ash, cottonwood, locust, elm, and introduced species, such as Norway spruce and Scotch pine, have been planted. The choice of species depends chiefly upon temperature, since moisture can be controlled by irrigation. (Pl. XXIII, fig. 2.)

The development of planting in California has been more rapid than in any other State in the region. High returns from plantations have already been secured, and the southern part of the State is likely to be a great producer of eucalyptus (hardwood) timber for many uses, especially furniture and wagon stock. It is estimated that there are at least 1,000,000 acres of land in the valleys of southern California upon which continued irrigation for the production of fruit is not feasible, but which can be irrigated from time to time, and are well suited for the growing of eucalypts. (Pl. XXV.)

The principal forest lands outside of National Forests lie in Washington and Oregon, west of the Cascades, and in California. Possibly 25 to 30 per cent of the cut-over lands in the former section will be devoted eventually to agriculture. Adequate fire protection and proper forest management will provide for a future timber supply on the remainder of these lands. Planting will be a small factor only, and supplemental to forest management, in order to restock areas that can not reseed naturally, because of lack of seed trees.

CONCLUSION.

From the problems of the various planting regions of the United States it appears that just as the greater portion of the forest area of the country lies in the East, so the amount of land requiring artificial restocking is greater in that region. Conservative lumbering

and forest planting within National Forests and by private owners in the West will maintain a permanent supply of valuable western conifers, but in the East the perpetuation of the best species of hardwood is dependent largely upon the activity of the private landowners. It is absolutely essential that the people of each State, and particularly farm owners, should realize the immense importance of individual effort in providing for a future timber supply. The quantity of land that can be restored to value through forest planting by the Federal Government or by the States is in the aggregate small and comparatively insignificant as compared to the great area that must be forested eventually by private landowners, among whom the farmer stands first and foremost.

In case the prospective planter finds himself confronted with a local problem concerning which he feels the need of special advice, he should correspond with The Forester, Forest Service, Washington, D. C., provided, of course, that the authorities of his own State are not in a position to furnish him with the information he desires.

COMFORTS AND CONVENIENCES IN FARMERS' HOMES.

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INTRODUCTION.

In traveling through the United States one is impressed by the untold wealth represented in comfortable homes and their surroundings. This is especially true of the cities and of the country places built by a population which is not dependent upon the tilling of the soil as a means of obtaining a livelihood. The past decade has witnessed marvelous advances in methods of cultivating the soil and caring for farm crops, but on many farms the improvement of the home has not kept pace with the times.

The days of the home spinning wheel and loom are past, but in many farm homes little has yet been done to lessen the burden of women's work, although labor-saving devices are both numerous and easily installed. Public opinion seems to be divided upon the question of conditions existing in the homes of farmers, but to one familiar with the facts the need of improvement is apparent. It is true that farmers and their families are, as a rule, quite comfortable and happy, but with the present labor requirements of the home too little opportunity is afforded for mental improvement or social life.

In times past the use of modern conveniences in the home was limited to cities and towns where water and sewage facilities were provided. With the advent of improved plumbing supplies and simple, yet effective, forms of power it has become possible at a moderate cost to install in the country home every convenience now available in the city dwelling. Throughout the country there is great difficulty in securing competent help for housework, and every appliance that is a genuine labor saver is a money-maker as well.

Where a new house is being built it will be possible to provide for the installation of the conveniences as the work of building proceeds, but there are now thousands of homes wherein no provision has been made for such necessaries as a bathroom, a kitchen sink, and water under pressure. It is in these cases that there is the greatest need for suggestions and information.

The first and most important consideration in home improvement is a wholesome and plentiful supply of water. Until recently it was necessary to locate the dwelling near the water supply, but with the

great advance in the manufacture of pumps and piping it is now feasible to transport the water any reasonable distance. Good water is one of the most valuable natural resources of the farm, and it would be difficult to estimate the value of an unfailing spring located within reasonable distance of the house. Frequently the most reliable, or perhaps the only, water supply for the farm home is located at a considerable distance from the dwelling, and the water for culinary and laundry purposes is either carried or hauled; here is the opportunity for the employment of labor-saving devices. Cases are known where families for three generations have carried water for all domestic purposes a distance of several hundred feet from a spring that is located at a higher level than the house, where an investment of a few dollars would have brought the flow of the spring into the kitchen by gravitation. On most farms, however, the dwelling is located at a higher level than the source of water supply, necessitating some form of pumping device. Water is heavy and few persons realize the labor required in lifting and delivering it where wanted for use.

The advent of the gasoline engine into common use on the farm has made possible the combination of a number of labor-saving facilities, including the pumping of water. It is now practicable to provide the most isolated country home with electric or acetylene light, modern sanitary fixtures, hot and cold water, dairy and laundry machinery operated by power, and even ceiling fans and motor-driven sewing machines. Some of these may be classed as luxuries, but others are conveniences that will greatly relieve the burden of work in the farm home.

HOUSE AND OUTBUILDINGS.

One of the important features in the making of a comfortable farm home is the proper location of the house and general outbuildings. The grouping together of all the buildings may not be practicable on large farms, but those that serve for the comfort and convenience of the family should by all means be near each other. Where the buildings are already located it will be difficult to remedy defects, and about the only thing to be done is to accommodate improvements to present conditions.

From a labor-saving standpoint the general plan and interior arrangement of the dwelling should be carefully considered. The old-type plantation house of the South combines many advantages. A large central hallway, most of the rooms on the lower floor, a broad, open staircase, numerous windows, and suitable provision for heating are some of the essentials of a comfortable home. The location of the cellar entrance and stairways with relation to the kitchen is one of the most important features. For the greatest

convenience there should be two entrances to the cellar, one inside the house opening directly from the kitchen or pantry, and one outside, by means of which all heavy or rough materials can be admitted or removed.

THE KITCHEN.

The ideal arrangement is to have the kitchen on the northeast corner of the house, where it will receive the early morning sunshine in winter and be protected from the excessive heat of the afternoon and evening during the summer months. For many reasons a southeastern exposure is most desirable for the dining room, with the library and living rooms to the west, where they will have the benefit of the evening sunshine. There are many advantages, especially in southern climates, in having the kitchen detached or at least separated by a passageway from the main portion of the house. In many of our northern homes there is provided a small building, located 10 or 15 feet from the rear of the house, which serves as a dairy, a laundry, a place in which to cut up meats and do butchering, and as a kitchen during the summer months. This detached arrangement proved especially desirable before the advent of the blue-flame oil cook stove, as the heat from a cook stove or a range was kept out of the dwelling.

The question of light and ventilation in the kitchen is of prime importance. Many of our farm kitchens consist of a mere lean-to or shed built on the back of the house, having one or two small sliding sashes for windows, a batten door, and very little provision for ventilation. Provided the openings are properly screened, it is almost impossible to have too much light or ventilation in the kitchen.

In planning the kitchen special attention should be given to the location of the working facilities. The mistake is often made of providing a kitchen that is much too large for the purpose, necessitating many steps in reaching different parts of the room. The distance between the kitchen table and the cooking range should not exceed 6 feet. It should be borne in mind that if this distance is increased one step two extra steps must be traveled each time in going and returning. In the course of a day the housewife or servant may be made to travel miles in doing the work. The sink and drain board should be near a window where they will have plenty of light, and, if possible, they should be at one end of the worktable. Even where water is carried into the kitchen by hand, a small sink is a decided advantage.

THE BATHROOM.

Any small room may be converted into a bathroom, or a small addition can be built on one side of the house at a very moderate cost. The bathroom should not be too small, 8 by 10 feet of floor space being

a desirable size. The interior arrangement of the bathroom may be made to suit local conditions, but some such plan as is shown in figure 18 will be found very economical. If the bathroom is placed on the second floor, as is usually the case in northern latitudes, it should be either over the pantry or the kitchen. In all cases the bathroom should be so located as to simplify the plumbing, especially the hot-water piping.

The entire fixtures for a very satisfactory bathroom can now be secured at a price not exceeding $35, though a more desirable class of fixtures can be had for $50 or $60. Formerly the services of an

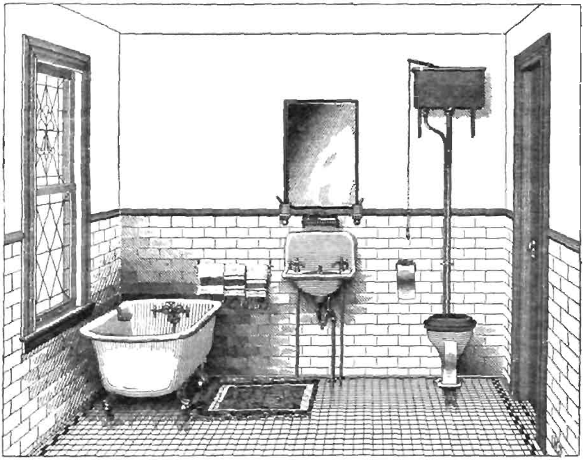

FIG. 18.—A conveniently arranged bathroom.

expert plumber were required to install such an equipment, but during recent years the fixtures for both the water supply and drainage have been so simplified that anyone of ordinary mechanical ability can accomplish the installation. Where it was formerly necessary to connect pipes by means of carefully made wiped lead joints, threaded connections are now provided which can be put together by means of wrenches. In case it becomes necessary to unite two pieces of lead pipe this may be accomplished by means of a cup joint by simply spreading the upper end of the lower pipe and tapering down the end of the pipe to be attached to it; then after scraping the connecting parts bright and clean a little solder is run around the flange by means of an ordinary soldering iron. This kind of joint is especially

adapted to use when the union may be made where the cup or flange of the lower pipe can rest upon a floor in the manner shown in figure 19.

The simpler and plainer forms of bathroom fixtures are now considered most desirable. Marble basins and lavatories are now replaced by the modern porcelain ware, which is less expensive, easier to install, and not so liable to breakage. Where lead pipe was formerly used to convey the water to different parts of the house its place is now taken by small-sized galvanized-iron piping joined by threaded couplings.

The use of a bathroom will require some form of water-heating appliance. Modern cooking ranges are generally provided with a "water back" or hollow plate along one side of the fire box. Water is supplied from a tank and circulates through this heating plate, and as hot water is drawn from the tank it is replaced by cold water from the service pipe. The hot-water pipe should connect to the top of the tank and then divide, one branch leading to the bathroom and the other to the kitchen sink.

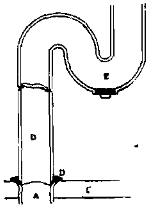

FIG. 19.—Sketch showing the cup-joint method of connecting lead pipe. *A*, Waste pipe; *B*, sink connection; *C*, floor; *D*, solder joint, or cup; *E*, trap.

THE WATER SUPPLY.

Whatever the source of supply—a spring, a well, a cistern, or a running brook—considerable labor will be saved by providing economical means of lifting the water and delivering it where required for use. If a strong spring is available with plenty of fall below it, the water may be forced to the house by means of a hydraulic ram. The ram is the simplest of water-elevating devices, and the cost of operating it is practically nothing, as the waste from the spring acts as a source of power for the delivery of a small, but constant, stream of water to the house. A ram will give good service wherever the flow of the spring is upward of 5 gallons a minute, with a fall of 8 or 10 feet within 45 or 50 feet below the spring. The water may be raised to a height of 60 or 75 feet above the spring, but not more than 6 or 8 per cent of the flow will be delivered to the house. However, this is generally sufficient for all domestic purposes.

A very simple and satisfactory device consists of a high-grade hand pump in the kitchen with a suction pipe leading to the bottom of the well or spring. Water can be drawn a distance of 400 or 500 feet, provided the perpendicular rise is not more than 10 or 12 feet. Water can be lifted by a suction pump to a height of about 30 feet, but 25 feet is practically the limit for best results. For each 25 feet of suction pipe when bringing water from a distance an allowance

of 1 foot less rise should be made. With a long suction pipe there should be a first-class foot valve on the end in the well or spring to prevent the water in the pipe working back when the pump is not in use.

Many sources of power for the pumping of water are available, such as windmills, hot-air engines, and oil or gasoline engines. Steam power is, as a rule, not adapted to the pumping of water on the farm, but with the increase in the number and efficiency of gasoline outfits it is a simple matter to provide for lifting water to a tank or delivering it direct to a house. There are small pumping engines on the market that can be had for $60 to $75, and which are arranged so that they may be bolted direct to the standard of an ordinary force pump and connect to the pump rod.

FIG. 20.—Tank and pump house for a home water supply.

Some form of storage tank will be desirable. A clean barrel can be mounted on brackets outside the kitchen and filled each day by means of a section of ordinary garden hose attached to a force pump in the well or cistern. An elevated tank may be so arranged that the rain water from the roof will flow directly into it and then to the kitchen through a piece of pipe and a stopcock. One of the most desirable outfits is that shown in figure 20, which consists of a small pump house about 8 by 12 feet in size, located either over or near a well or spring, a small gasoline engine, a pump of standard type and make, a steel tower 20 to 40 feet in height, and a tank holding approximately 50 barrels. The tank should be securely roofed over to prevent the entrance of birds or mosquitoes and other insects. An outfit of this kind will under most circumstances cost from $250 to $350.

Another method, and one that is growing in favor, consists of a closed pressure tank with a capacity of 500 or 600 gallons which is either buried below the frost line or placed in the cellar. In operation the water is forced into this tank at the lower end or side, the air inclosed in the upper part of the tank acting as a cushion to provide pressure for the delivery of the water through the service pipes. Before filling the tank for the first time enough air should be pumped into the tank to increase the pressure a few pounds; this can be accomplished by means of a bicycle pump or by inserting a small petcock about midway of the pump cylinder and admitting a little air with the water that is being pumped. This form of installation places everything under the ground, out of sight, and safe from frost. The water remains cool during warm weather, the tank does not shrink and leak during dry weather as does a wooden tank in the open air, and no protection is necessary to keep birds and insects from getting into the water supply.

The various methods of providing for the delivery of the water to the dwelling are too numerous for a detailed description and must be worked out to suit local conditions. Small galvanized-iron piping can be fitted by almost anyone by the aid of a set of tools for the purpose. The necessary outfit consists mainly of pipe cutting and threading dies, a pair of pipe wrenches, and a pipe-holding vise, the whole outfit costing $12 to $14.

SANITARY REQUIREMENTS.

Proper drainage is just as essential for the farm home as for the city dwelling. The old method of surface drainage is not safe on account of its disease-spreading tendencies. With the water brought into the house the work of saving labor will be only half complete unless a permanent sewer system is provided. Terra cotta or vitrified pipe of 3, 4, 5, and 6 inch sizes, with the joints firmly cemented together, will answer every purpose for carrying waste to some point of safe discharge at a distance from the dwelling. All sinks, lavatories, and water-closets should be provided with traps to prevent the escape of foul gases into the dwelling, and outside the house a ventilated running trap should be inserted in the main drain. The kitchen sink should be mounted on brackets and, together with a metal back and two faucets, should cost from $3.50 to $12, according to size and quality.

There is perhaps no single feature of the farm-home surroundings so neglected as the provision and care of the toilet facilities. The average privy on the farm is a menace to the very life of the community by the spread of disease through the agency of flies. The indoor water-closet, in connection with the bath, is the most sanitary arrangement, especially where the sewage can be disposed of at some

distance from the house and in such a way that there will be no danger of contaminating either the home or neighborhood water supply. The best method of disposal is to first pass the waste through large concrete septic tanks, then to discharge the overflow upon cultivated land where garden crops are not grown. Even where an indoor closet is maintained it will generally be necessary to provide a privy on the outside, but the vault should be of concrete construction and so connected with the drain that it may be flushed out from time to time. Plenty of disinfectants, such as chlorid of lime, should be used, and everything should be so constructed that flies can not gain access to the vault or the sewer openings.

PROTECTION AGAINST INSECTS.

One phase of sanitation very frequently neglected by farmers is that of protecting the home from insects. Not only should the dwelling be properly screened, but precautions should be taken to avoid the formation of breeding places for flies and other insects. Flies breed principally in stable and chicken manure, and the only proper method is to keep the stable and poultry house clean. The floors of the latter may be sprinkled with land plaster, or fine dust from the roadway will answer. All pails and other utensils used for handling milk should be promptly cleaned and all refuse should be removed from about the dwelling to prevent flies finding suitable food. Anything that will attract flies to the house is a menace to health, for it has been found that wherever flies are abundant about the doors they gradually find their way in despite precautions. Mosquitoes breed in rain-water barrels, old tin cans, or any receptacle that holds stagnant water, and the careful elimination of breeding places will go a long way toward personal comfort in the home. A slight film of kerosene or other light oil over the surface of standing water will prevent the breeding of mosquitoes.

The efficiency of window and door screens depends largely upon their proper arrangement to prevent flies and other insects being driven into the house as persons enter. A screen door should always open outward, and should be so hinged that flies will not congregate on an adjoining wall where they can easily enter as the screen is opened; the door should swing so that the flies will be behind it when opened. Window screens should either cover the entire window or fit tightly below the upper or outside sash.

THE LAUNDRY.

Where the laundry work is done in the home a few special facilities will greatly lighten it. Considerable of the work connected with the cleansing of clothes consists in the handling of the tubs, clothes wringer, and wash boiler, together with the cleaning and storing of these after use. In many farm homes the only place where washing can be performed in winter is in the kitchen, with all of its attendant

unpleasant features. If a special room can be provided, either in the basement of the house or in an outbuilding, all of the equipment can remain here from one week to another and very little time will be required to get the work started. If the laundry room can be provided with a small stove for boiling the clothes, considerable inconvenience will be saved. A well-equipped laundry room should have stationary tubs, a cement floor, hot and cold water, a washing machine, a clothes wringer, a stove, and an ironing table. As an adjunct to the laundry there should be provided in the yard a permanent wire clothesline. If stationary tubs are not employed there should be provided a trap in the floor into which waste water can be poured without lifting the tubs to a sink.

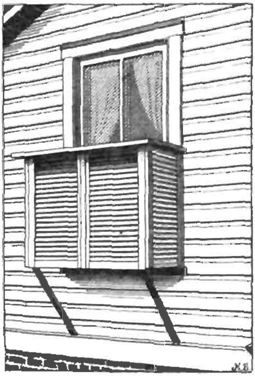

FIG. 21.—Window ventilator or open-air cupboard.

In certain thickly populated country districts the cooperative laundry scheme is giving good results. This plan is generally carried out in connection with a dairy or some already existing enterprise. A suitable building is erected and provided with a water supply and drainage, heating and power facilities, stationary washtubs, a drying room, and washing and ironing machinery. A competent person is employed to look after the general work of the laundry, and the greater part of the washing and ironing is performed by the persons who bring in their wash on the appointed day each week. This plan avoids all the unpleasant features of doing the work at home, and with the drying room the weather has very little influence upon the prompt completion of the laundry work.

SMALL CONVENIENCES.

In addition to the larger and more important facilities for lessening housework, there are several small devices, the greater number of which can be made at home at odd times and at a very small cost and which will go far toward the comfort of the persons doing the work. One of these is a ventilated window or outside cupboard for the keeping of meats, vegetables, and other necessaries of the kitchen. This cupboard consists of a sort of extension built on the side of the kitchen, generally occupying the lower half of a window, and is made of slatted blinds such as are used for window shutters.

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In fact, one pair of shutters cut in two in the middle will form the entire outer portion of the box. A good idea of this device can be gained from figure 21. After nailing the blinds together a floor and roof are provided, and, if desirable, a shelf may be added about half way from the bottom. A top covering of tin or roofing paper is essential and should be put on over the boards. Before putting in the shelf the inside of this ventilated box should be lined with fly-screen wire to prevent flies and other insects getting in. After this device is installed in the lower half of a window it can be reached by simply raising the lower sash. By actual experience this has been found to be one of the greatest labor-saving devices that can be installed in a modern kitchen.

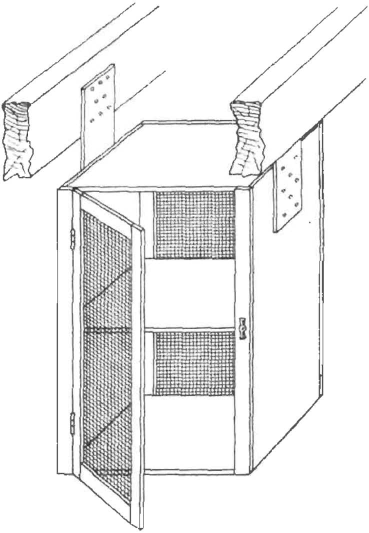


FIG. 22.—Sketch showing a cellar cupboard. The cross line represents fly-screen wire.

Another similar device, known as the *hanging cellar cupboard*, as illustrated in figure 22, can be made from an ordinary store box, a pair of hinges, and two small pieces of fly screen, the entire cost not exceeding 60 cents. Two sides of the box are covered with netting, one side being in the form of a door. Some of the boards removed from the box are used to form the frame of the door, while the remainder will form the shelf and supports. When completed the outfit is suspended to the joists at a convenient place in the cellar. This is an improvement over the old form of hanging shelf and may be used for the storage of cooked meats and foods. It has certain advantages even where an ice box is maintained. Where any meat or vegetable has been boiled and it is desirable to let it stand to cool, it may be safely placed either in the ventilated window or in the hanging cupboard in the cellar without fear of molestation by flies, and at the same time all steam and odors are given an opportunity to escape.

Where a cream separator is not employed in connection with the dairy work, a milk trough of concrete construction placed in one side of the cellar is a great convenience. An idea of the method of constructing a trough of this kind may be gained by reference to figure 23, which shows a longitudinal section indicating the proper way of installing the overflow and cleaning-out pipes; also the desirable height and elevation above the floor. The deeper portion of the trough is intended for the accommodation of the cream jar or milk cans, while the shallow portion is designed for ordinary milk crocks or pans. The fresh water from the well is admitted at necessary intervals through a faucet, and when it rises to the level of the outlet pipe it flows over and passes into the drain. The elbow *B* on the inside of the tank is essential to form a trap or seal in the drainpipe to prevent the admission of any gases or odors from the drain. Such a milk trough should be installed only in a cellar that is well ventilated and free from unpleasant odors, and one for which drain-

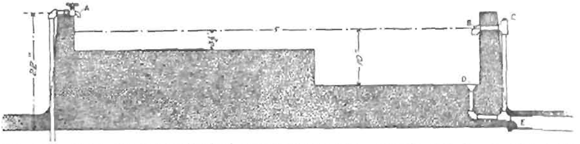


FIG. 23.—Sketch showing method of constructing a concrete milk trough. *A*, Faucet for admitting water; *B*, overflow pipe; *C*, cleaning plug; *D*, outlet plug for cleaning trough; *E*, tile drain; *F*, level of water in trough.

age has been provided. The drain leading up to the trough should be 3 inches inside diameter, and should connect with the cellar drain.

THE HEATING AND LIGHTING OF THE FARMHOUSE.

The question of how the farm dwelling should be heated will depend largely upon local conditions and the character of fuel to be used. Formerly our country dwellings were heated almost universally by means of stoves or, going still farther back, by open fireplaces. In the present day the open fireplace is a desirable feature of the library or general living room, but is not of great economic value as a means of heating except in southern climates.

In many of our farmhouses may be found modern heating appliances, consisting of either a hot-air furnace or a steam or hot-water equipment. Suitable heaters are now upon the market designed for the use of almost every kind of fuel.

The installation of heating appliances of an improved type is one of the most expensive features of home improvement. The cost of such installation will be approximately $50 for each room so heated. In some cases the work may be done for considerably less, but it is always well to figure on the highest price.

During recent years various forms of apparatus for lighting country homes have been devised. Kerosene has certain advantages, but the labor of caring for lamps is considerable. In all cases where lamps are used those of brass or similar metal should be selected in preference to glass. Metal lamps are safer than glass and are also more easily cleaned and handled.

Acetylene gas is now used quite extensively for the lighting of farmhouses. The installation of an acetylene outfit is rather too expensive for the average farm home, the generator costing from $125 to $250, in addition to the piping and lighting fixtures. This would bring the entire expense to approximately $300 for a seven or eight room dwelling. After the installation is effected, however, the cost of maintaining a plant of this nature is not great.

A number of manufacturers of electrical appliances are now producing small equipments for use in country places. These outfits consist of a generator which will furnish sufficient current for twenty-five or thirty 16-candlepower lamps, together with a controlling board and the necessary equipment for the installation. The cost of an electric lighting plant of this nature, exclusive of the engine, will be about equal to that of an acetylene gas plant. Provision is generally made for running the generator with the regular power provided for pumping water and doing other work upon the farm.

OTHER CONVENIENCES.

Among other conveniences that add to the comfort of the farm home is a good garden conveniently located near the house, where the women of the household can take an interest in the growing of the crops without actually performing the labor required and where they can go for a supply of fresh vegetables.

The presence of shade trees and of a well-kept lawn with its beds of various flowering plants will add greatly to the comfort of the home, even though they are not labor savers.

Another important feature of modern country home life is the addition of the telephone, which brings neighbors closer together for the exchange of ideas and the quick transaction of business. In addition to the commercial value of the telephone it promotes the social welfare of the community.

Not every farmer is in a financial position to provide all the conveniences mentioned in this paper, but many of these devices and arrangements can be had at very little cost, their introduction depending largely on ability to adapt the materials at hand to the improvement of general home conditions.

PREVENTION OF FROST INJURY TO FRUIT CROPS.

By G. B. Brackett,
Pomologist, Bureau of Plant Industry.

EFFECT OF FROST ON FRUIT CROPS.

The fruit grower, from time immemorial, has been at the mercy of the elements. Frost is one of the most formidable foes with which he has to contend. Millions of dollars are lost annually by silent, relentless frosts that come either when the trees are in blossom or just after the fruit has set.

Recent demonstrations in the fruit district of the Middle West have proved beyond a peradventure that damage to fruit trees by frost can be controlled to a greater or less extent. One of the fundamental principles that underlie successful frost fighting is a knowledge of the subject of air drainage. Cold air, like water, settles to the lowest ground, and anything that will break up this stratum of cold air and cause it to mix with the upper strata of warm air will prove of great value in combating frost injury.

Frost injury to fruit trees most frequently occurs when there is a clear, still, dry atmosphere, and when the radiation is uninterrupted by clouds or moisture, and the cold air settles in poorly air-drained areas.

While frosts may not be severe, they are often just severe enough to damage the blossoms and tender fruits, and they not only reduce a crop of fruit one-third to one-half of what it should be, but sometimes destroy the entire crop for one year or for several successive years.

In order to overcome destructive atmospheric conditions three original methods have been tried: (1) Explosives, (2) smudges, (3) heating devices.

EXPLOSIVES.

Explosives were first used in the vineyard districts of Austria, France, and Italy, where hailstorms and frost were prevalent and were destructive to the grape crop.

Many years ago, Mr. Albert Stiger, burgomaster, Windisch-Briestrits (Lower Steirmark, Austria), we are informed, owned extensive vineyards on the lower slopes of the Bacher Mountains, a locality persistently visited by destructive hailstorms. He decided to drive

the clouds away by the use of explosives and he established six stations on six of the surrounding mountains, a locality 2 miles in extent. The stations, built of wood, sheltered ten heavy mortars each, and near each station was a cabin in which powder was stored. A corps of volunteers consisting of neighbors and owners of small vineyards was trained to proceed to the stations and handle the mortars whenever there was the slightest indication of a storm. Each mortar was loaded with about 4½ ounces of powder; the firing was simultaneous and continuous until the clouds were either scattered or blown away. This also had a tendency to break up the stratum of cold air and prevent its settling in the low grounds. These experiments were practiced for some time and are said to have been successful.

SMUDGES.

The damage to fruit buds by frost is more severe when the sun's rays, following a night of cold, are allowed to fall on the trees. To prevent this sudden change from freezing to thawing the system of smudging was adopted.

After many series of experiments it is said that Mr. Bellot des Minieres recommended the accumulation at various points in the orchard or vineyard of combustible matter capable of producing a thick, black smoke. He believed that if heaps of fuel were set on fire at sunrise, the resultant smoke would make a thick, black, impenetrable veil that would protect the vines from the sun's rays and would maintain a general temperature in the vineyard at a point that would counteract the effects of frost. The purpose of this method is to prevent the radiation of heat from the earth's surface and to shield the fruit buds from the sun's rays by creating a cloud of smoke over the area to be protected.

Consul D. I. Murphy, Bordeaux, France, 1908, reports a device invented by Mr. Edouard Lestout, of that city, for making artificial clouds for the protection of vineyards. Small wooden boxes, open at the top, were filled with an inflammable compound consisting of equal parts of resinous and earthy substances, such as clay and the like, reduced to fine powder and pressed into a compact mass. In the center of each box a wick extended through the mass and served to ignite it; or the wick could be dispensed with and the compound ignited by pouring over it a few drops of kerosene or alcohol and lighting it with a match. The boxes were made of pine wood and were 8 inches long by 6 inches wide, and were placed 30 feet apart in the vineyard. The most dangerous frost period for grapes was found to be in April, when the young shoots were showing vigor and the sap was flowing freely. Mr. Lestout found little danger from a dark or cloudy morning that followed a cold night, but the danger

occurred on the clear mornings when the sun's rays shone directly on the unprotected plants. This invention probably led to the use of the smudging devices so extensively used subsequently in California.

Vapor smudge, as first used, is accredited to Meacham. Small areas were covered with wet straw, manure, and cypress brush; this material was burned in quantities and evaporating pans were constructed which were calculated to have a sufficient capacity for furnishing enough vapor to cover the areas owned by the individual operator. It is said that eminent engineers made estimates for such work, but they miscalculated the absorptive power of large, adjacent dry-air bodies, and the vapor, as fast as generated, disappeared into space. They evidently failed to note the fact that they began their work in the valleys at the lowest stratum of cold air, and that to be effective the vapor-producing heat should have been radiated from the areas above the valley.

This method had also the weak point of necessitating the cooperation of every landowner in the valley. It had to be accomplished on a whole-sale scale to be effective, for no individual could cope single handed with the elements.

In early days, pioneer lemon growers in California located their groves in the valleys, with no thought of the law governing the gravitation of cold air, and their efforts resulted in almost complete failure. The cold air from the snow-capped mountains flowed down to the lowest ground whenever there was no wind to keep up the circulation. This mistake was soon discovered and subsequently plantings were made upon higher plateaus.

HEATING DEVICES.

THE USE OF COAL FOR HEAT.

Edward Copley is credited with inventing the heating device consisting of wire baskets and a machine to manufacture them cheaply. The baskets were filled with kindling and about 25 pounds of coal. They were then scattered about the orchard, about 25 to the acre, suspended by wires to limbs of trees and by iron rods to limbs in budded orchards. This system accomplished what it was intended to do, but coal is heavy to handle and sometimes difficult to ignite, especially after a rain.

Later a firm in Los Angeles manufactured and sold a briquet; this was made after the style of the briquets used in Germany. It consisted of a tube composed of sawdust, oil-refinery refuse, and low-grade oil pressed into shape and used with or without a wick. A modification of the method was later made by introducing cheap sheet-iron stoves properly dampered, and in which the briquet material was made to burn without compression. The material to be

burned was shipped in sacks to the grower. This form of heat did the work of successful frost fighting, but had the disadvantage of being bulky, and the labor of handling both stoves and material was rather excessive and costly. The sheet-iron stove has undergone various modifications and there are patented devices of it made by persons in California, Colorado, and elsewhere.

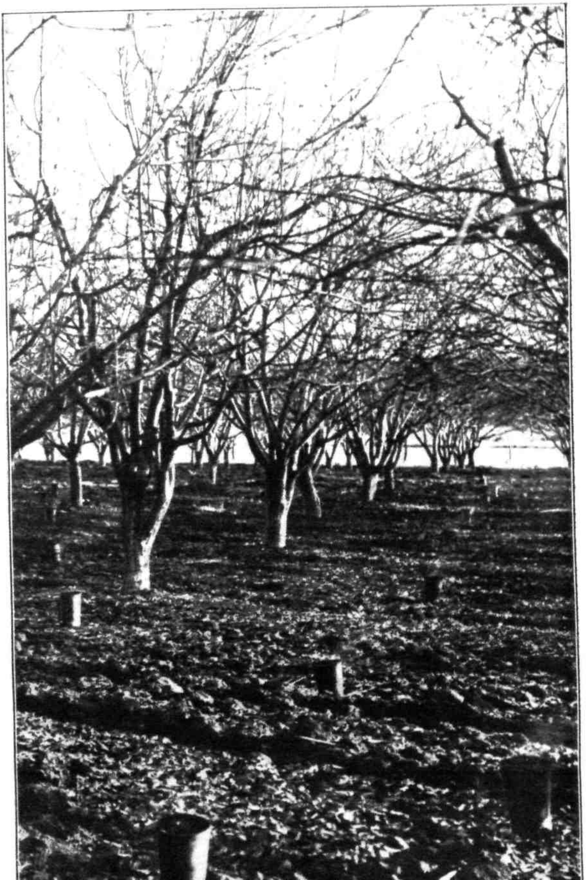
THE USE OF OIL FOR HEAT.

In orchard heating the fuel to be depended upon must be easy to light, a fuel that will burn a long time and that will give out a great amount of heat; it must also be easily controlled in regard to temperature. Oil, in some form, doubtless best meets these requirements, but where oil is scarce and coal abundant the latter would be the cheaper fuel.

FIG. 24.—Oil heater. Capacity 7 quarts of oil.

The oil heater, so far as we know, was first manufactured by a firm in Fresno, Cal. Since then several styles of oil heaters have been manufactured and put on the market. One of these well-known and extensively used orchard oil heaters, constructed on scientific principles, has a center-draft tube that feeds oil to the flames, promotes combustion, and makes good use of the oil. The heater holds about 5 quarts of oil, will burn six or seven hours, is made of 28-gauge iron, and weighs, with cover, 1¾ pounds. It stands 11 inches high. The heaters nest nicely, fitting one into the other, for shipping purposes. The cover is made to fit like a lard-pail lid, and is raised in the center so as to shed water. This heater has successfully stood the test of several years. It is successful because based on the principle that there is no need for great heat locally, but for numerous small fires well distributed. The small fires do not necessarily change the direction of the air draft, the object being to warm up the draft as it is pressed down from above by the settling of the colder air, and thus avoid the forming of cold spots or pools. Above the danger point the upper air strata are warmer, and usually a few degrees of rise in temperature is all that is necessary for safety.

An oil heater that will hold 7 quarts of oil and burn ten hours is shown in figure 24. This heater is so arranged that the heat may be increased or diminished at will. There are larger heaters that hold 6 gallons of oil and burn thirty-five hours, but the medium size is deemed best for all practical purposes. An apple orchard equipped with oil heaters is shown in Plate XXVI.



APPLE ORCHARD EQUIPPED WITH OIL HEATERS.

An oil heater can be more easily and quickly filled and lighted than a coal heater. Crude oil has been furnished in tank lots at about 4½ cents a gallon and it makes a quick and excellent fire and an intense heat. It is a fuel that will require little or no attention after lighting, but gas oil is considered far better. By using oil one man can care for 3 to 5 acres for four hours, and this is about as long as it is customary to use a heater at any one time. One hundred oil heaters are used to the acre and they can be made to raise the temperature from 10 to 15 degrees. These heaters range in price from 15 to 25 cents apiece. The fire can be easily extinguished; the heater is perfectly adjustable and can be closed so that 4 quarts of oil will burn twenty-four hours, or the oil can burn like a bonfire and be consumed in two hours.

Heaters may not be necessary, but if needed will be needed very badly and very quickly. Anyone who has 10 acres of orchard located in the frost belt can afford to use a carload of oil. This oil may be stored in the orchard in iron tanks or in cisterns made of cement. The tanks cost about $75 each and the oil may be saved from year to year if not used. Crude oil has its objections. A disagreeable, greasy soot is produced by it which settles on trees, buildings, outbuildings, and even on the inside of buildings.

PREVENTION OF FROST INJURY POSSIBLE.

From the abundance of testimony already obtained from reliable sources in various parts of the country, it is safe to say that the prevention of frost injury to fruit crops has passed the experimental stage and has become a well-established fact that can not be controverted or lightly passed by.

For the past two years thrilling frost fights have occurred in Colorado. In 1908 two men saved large crops on the heated half of their places and lost them on the half not heated. This was a practical object lesson to fruit growers, who as soon as they saw what had been done investigated the matter thoroughly, and the growers at Canyon City appointed an orchard-heating committee, the first in existence. With $1,000 at their disposal they zealously made experiments to determine just what could be expected in the way of raising the temperature and what the cost would be. For six months these experiments were tried with every sort of fuel and the various market devices for burning it. After an extensive investigation the committee unanimously recommended oil as fuel, it being as cheap as any other and the fires more easily obtainable. It is said that in 1909 there were orchard heaters in every fruit section in Colorado, and in some sections 80 per cent of the orchards were equipped. The statement following was made by a member of the committee.

The spring of 1909 was severe, proving to be one of the worst in the history of the State, and had lack of protection been as formerly, little, if any, fruit would have been shipped from Colorado. As it is, one of the largest crops in the history of the State will be gathered, and it is estimated that $4,000,000 was saved by orchard heaters to the fruit interests of the State.

The experiments of the orchard-heating committee (which tests are a matter of record) showed that the temperature could be raised 14 degrees on a still night with 100 pots to the acre. The experiments this past spring in time of actual danger fully substantiated the claims made by the committee.

The last night of April, 1909, the thermometer in the Canyon City district fell to 17° above zero. The orchardists with oil heaters kept the temperature up to 28 or 30 degrees, or what they considered the safety point. On the preceding night there was a terrible blizzard; the wind blew a gale and there was over 8 inches of snow, which kept the oil from burning as freely as it otherwise would, but in spite of these awful conditions the temperature was raised from 21 degrees, where it remained for over five hours, up to the safety point.

As an experiment several acres were left unprotected by heaters, heating the balance of the orchard. There is a banner crop on the heated orchard, probably more than 15,000 boxes; while on the several acres not heated, on which are 100 trees 10 years old in full bearing of late winter varieties, there will not be a box of apples. One who has never realized the relief of saving the crop can not understand the feeling. In times past Colorado growers have gone to bed knowing they would be practically ruined before morning should break, and feeling absolutely helpless to do anything to protect themselves. This year the aspect is very different; the towns and surrounding country were perfect beehives of activity, and as soon as the danger signal sounded thousands of volunteers hurried to help the orchard men, and for hours the battle waged, never slacking until the great foe was vanquished.

In this orchard district of Colorado an exceptionally large crop of fruit was marketed from the orchards where the heaters were used.

The same experiment has also been tried in New Mexico, where results were equally successful. Mr. Parker Earle, of Roswell, N. Mex., reports a case in the Pecos Valley where 2,600 oil-burning heaters of 1-gallon capacity were used on a 30-acre orchard with the result that a full crop of fruit was saved and sold for $26,000, while in the rest of the valley the apple crop was almost a complete failure.

Successful frost fighting is comparatively new. It is necessary to have a force of men, industrious, careful, painstaking, and observing to the last degree. And it is no pleasant task to rush out into the still, cold night to drudge laboriously all or a part of the night to save your own orchard or that of your neighbor. Unless the work is properly done it had better not be done at all.

As stated, the worst damage may be expected in April or during the blossoming period and the time when the fruit has set. Any temperature lower than 28° F. is likely to destroy a crop. The margin, in degrees, between danger and safety is usually small, the thermometer at such times varying for a few hours at a time from 28° to 20° F. The temperature can be raised by the oil pots at least 12 to 14 degrees.

The necessity for being prepared for frost fighting can not be too strongly urged upon orchardists. Changes in the weather are sudden and often the unexpected happens. A balmy spring morning with a southerly wind and an April shower will cause the fruit buds to burst forth prematurely; then suddenly the wind changes to the north or northwest, the clouds disperse, and a clear, cloudless night follows, when a dangerous frost will probably occur and do much damage unless the orchardist is prepared to save the crop by raising the temperature above the danger point. The freezing of the blossoms is likely to occur in the early hours before sunrise, a time when the temperature usually reaches the lowest mark. To guard against such emergencies everything should be provided for weeks in advance.

Thermometers should be placed in the orchard at convenient distances apart in order to maintain a uniform system of temperature readings, and a thermometer should also be located in an accessible spot near the house, where it may be readily seen at all times. It should not, however, be placed on the house, as the heat from the building will modify the temperature several degrees.

A device for sounding an alarm of approaching danger which is said to be in use by some orchardists consists of a specially constructed thermometer connected by wire with an electric bell located in the house. When the mercury drops to near the freezing point the bell sounds the alarm in time to arouse the inmates for immediate action. One of these thermometers, or thermostats, costs about $20.

Another electric appliance that has been used in California is the orchard heater lighter. The heaters are placed at uniform distances apart in the orchard, as previously stated, about 100 heaters to the acre. By a system of electric wiring and by means of a spark plug it is possible to light every oil heater simultaneously and almost instantly.

In the areas which are visited by killing frosts this method of insuring against possible injury is a necessity, for if the apparatus is needed it is usually at some unexpected time and it is then needed very promptly. The saving of a single crop more than compensates for the expenditure for apparatus many times over.

A rapid lighter for lighting smudge pots is a recent invention, costing about $4. It consists of a can holding about five quarts, made of heavy enameled tin, the tubes, ratchet, lever, and valves being made of brass. One gallon of liquid, consisting of half kerosene and half gasoline, or all gasoline, is put into the can. The can is carried in the left hand and a torch in the right. The torch can be so arranged as to knock or pull off the cover of the previously filled oil pot; then with the index finger of the left hand the spring-acting lever on top of the gasoline can is moved over the smudge oil pot and

instantly there drops a small teaspoonful of gasoline on top of the oil. The torch is immediately applied to the dropped gasoline, which ignites and starts the gas in the smudge oil. It requires so little time at each pot that it is hardly necessary to come to a full stop. One gallon of liquid is sufficient to light 800 smudge pots.

An orchardist does not hesitate to spend $400 for apparatus and material with which to spray his orchard in order to successfully fight insect pests and fungous diseases. The necessary apparatus for successful frost fighting is neither complicated nor costly and should be kept on hand, provided the grower's orchard is in the frost belt.

The Weather Bureau publishes a series of maximum and minimum temperatures for the various sections of the United States; it also publishes the dates of probable killing frosts, for both spring and fall, for the frost-belt districts, and in addition to this its forecasters are able to send out a warning of probable frost injury about ten to sixteen hours before frost is likely to occur.

While orchard heating is comparatively new and the system needs to be perfected in some of its minor details, many thousands of dollars can be saved annually by properly protecting the orchards from frost injury by the use of artificial heat.

THE HANDLING OF DECIDUOUS FRUITS ON THE PACIFIC COAST.

By A. V. Stubenrauch,
Expert in Charge of Fruit Transportation and Storage Investigations, Bureau of Plant Industry.

INTRODUCTION.

The fruits classified under the general term "deciduous fruits" are those produced by trees which drop their leaves in winter. They are called "deciduous" to distinguish them from the citrus fruits, which are borne on evergreen trees. The fruits which come under this designation, and which are shipped in a fresh state from the Pacific coast, include apples, apricots, cherries, peaches, pears, plums (including prunes), nectarines, grapes, and the small fruits, such as strawberries,[a] raspberries, and blackberries. The handling problems included in this article refer to the preparation of the fruit for shipment and for marketing in the fresh condition, although the greater part of the deciduous fruits grown on the Pacific coast is marketed not in a fresh condition, but as canned and dried fruits of all kinds, including prunes and raisins.

There has been an enormous growth and development of the deciduous-fruit industry on the Pacific coast. Up to twelve years ago most of this development had been in California, where the fresh-fruit shipments in 1909 equaled 15,280 carloads, but recently the planting of deciduous-fruit orchards in the States of Oregon, Washington, Idaho, Colorado, and Utah has been made on a very large scale. The development of these new districts and the rapid increase in the production of deciduous fruits have alarmed many of the growers, especially in California, at the possibility of overproduction, and the advisability of adopting means to prevent further planting, or at least to stop overdevelopment and the booming of new regions by land speculators, has been seriously discussed. Plans are being made to increase the demand for and consumption of these fruits by advertising and by the development of new markets. It is at last realized that too much attention has been given in the past to the business of inducing people to plant fruit trees and that not enough consideration has been given to the selling of the crop and to finding a profitable market for the fruit that is already on hand.

[a] While the strawberry holds its leaves through the winter, its fruit is similar to the deciduous fruits in its shipping requirements, and it is therefore classed with them.

TRANSPORTATION PROBLEMS.

The problems connected with the transportation of deciduous fruits from the Pacific coast are essentially problems growing out of the necessity for wide distribution. Ever since the first carload of fresh fruit was shipped from California, in 1869, the bulk of each crop has had to be marketed in the Eastern States. It is a remarkable fact that this business, built up on the far western edge of the continent, has been and will for many years continue to be almost wholly dependent upon the Atlantic seaboard and adjacent States for a market. The fruit has to be transported 3,000 miles, crossing lofty mountain ranges and hundreds of miles of desert, to the cities and centers of population of the East and Central West. Great engineering problems have had to be solved in accomplishing this result. It is stated that in crossing the continent a car has actually to be lifted or raised a vertical distance of more than 2 miles. Upon the safety, efficiency, and dispatch of the transportation facilities depends the whole success of the fresh-fruit industry of the Pacific coast. The perishable nature of the product and the difficulty in handling such an industry 3,000 miles from the center of consumption have made it necessary to develop an ample and efficient fruit-refrigerator-car service, which is now admitted to be the largest and best of its kind in the world.

The distance which the fruit has to be transported and the expense and risk involved necessarily require that the fruit reach the market in the best possible condition. This has enforced a degree of uniformity in grading and packing which, together with the high shipping qualities of the western fruits, is largely responsible for the successful marketing of the Pacific-coast product in competition with the eastern fruits produced near the markets, but which, taken as a whole, are not as attractively or uniformly packed. The difficulties and the expense of shipping and marketing the Pacific-coast fruits to some extent safeguard the grower against the temptation that confronts the eastern grower, with near-by markets and lower freight rates, to attempt to market large quantities of inferior, badly graded, and poorly packed fruit.

It must not be assumed that no poor packing is done and that no poor-grade fruit is shipped from the Pacific coast. In fact, much of the western fruit has the reputation of being poor in quality, though often beautiful in color and fine in appearance. This reputation has not militated to any great extent against the sale of western fruit, owing to the fact that the consumer has thus far bought fruit products principally on appearance. But as competition grows keener and as high-grade fruit from near-by sections comes to be more carefully and attractively packed so as to reach the market in sound condition,

fruit of poor quality will suffer. The poor quality of some of the western fruit, especially the peaches, apricots, plums, and other quick-ripening fruits, is the result of picking long before the fruit reaches full maturity in order to protect it against the ripening which takes place during the transcontinental trip. After fruit is picked the ripening processes progress much more rapidly than they do under the same conditions of temperature while the fruit is on the tree. Unless some means are employed to check this ripening as soon as harvested the fruit is too far advanced, even under the present method of refrigerator-car shipment, before it reaches the market.

The overcoming of this difficulty is one of the most important problems connected with the handling and the shipping of deciduous fruits on the Pacific coast. The peach growers of the Pacific Coast States have this problem to face in insuring the good quality and sound condition of their product on arrival in the markets. The grape growers of California and other States find their markets and their season of marketing limited, and in order to provide for the increased production from young plantings both markets and season must be extended. The raspberry growers of the Puyallup district in Washington desire to extend the marketing of their product beyond the present limits. The cherry and prune growers of the Willamette Valley of Oregon have to overcome quick ripening and deterioration in order to lengthen their marketing season and to extend to markets which it is now impossible to reach. The pear growers of the Rogue River Valley and the Jonathan apple growers of the Hood River Valley in Oregon also find their markets limited by lack of proper facilities to provide against the quick ripening and the deterioration of their product.

HANDLING, PACKING, AND MARKETING.

The deciduous fruits are produced under the most diverse conditions—in the valleys, in the foothill and mountain districts, under irrigation, and with natural methods of tillage. Under such varying and extreme conditions the product varies in quality and appearance as well as in season. It is owing to this diversity in the conditions of production that the problems of deciduous-fruit handling and of marketing have not been systematized and organized as they have been in the citrus-fruit industry. The citrus-fruit industry is largely organized into associations of growers. The fruit of the different growers is uniformly graded and packed in central packing houses owned by the association, each packing house having its own brands to designate the different grades. The fruit is not shipped under the name of the grower who produces it, as all of the fruit of the same grade is pooled. Many of the associations of growers also pick and

haul the fruit of the members to the packing house. They have developed trained gangs of pickers and other laborers who work under efficient foremen, and they, more than those engaged in any other agricultural industry in the country, have evolved methods to insure the careful and uniform handling of the product.

In the handling of deciduous fruits this system does not prevail except in local areas. There are few central packing houses except in some of the grape districts in California. The greater part of the deciduous-fruit crop is packed in the orchard where it is grown, usually by the grower, except in some of the apple and other fruit districts in Oregon and Washington. While certain standards of grading and sizing are supposed to exist, they fall far short of the uniformity prevailing in the grades and brands of citrus fruits. When packed in central packing houses each grower's fruit may hold its individuality until it is sold. The establishing and maintaining of uniform grades and brands, except in the case of growers having a large acreage, is impossible under this system. It frequently happens that a carload consists of fruit from 25 to 50 growers, each packing and handling in his own individual way. It naturally follows that there is the widest variation in the packing and grading, although the shipping companies have standards to which the grower must conform in a general way.

The one great object in growing fruit is to sell it at a profit. Fruit growing is a business, and as such is dependent upon business methods and principles quite as much as the manufacture and sale of boots and shoes, of steel implements, or of other articles. The manufacturer realizes that the success of his business depends upon the proper distribution and sale of his products, and he pays as much attention to the selling as he does to the manufacturing. It is the business of the fruit growers, either for themselves or through their agents, to study commercial methods and principles and apply them to their industry. With the establishment of better distribution and business methods in marketing fruits, the dangers from overproduction will largely be avoided.

This means, first of all, the production of first-class fruits, uniformly and honestly graded and packed and delivered to the consumer in sound and attractive condition. This is the business of the growers, and is the fundamental factor upon which depends the success of the industry. Too often the growers have ascribed the cause of their difficulties to others—to the shippers, to the transportation companies, to commission merchants, or even to the weather—losing sight of the fact that with the exercise of a little care and good judgment on their part many of these difficulties would not exist. The fruit growers of the Pacific coast have mastered most of the problems relating to the production of the fruit—such as relate to the various

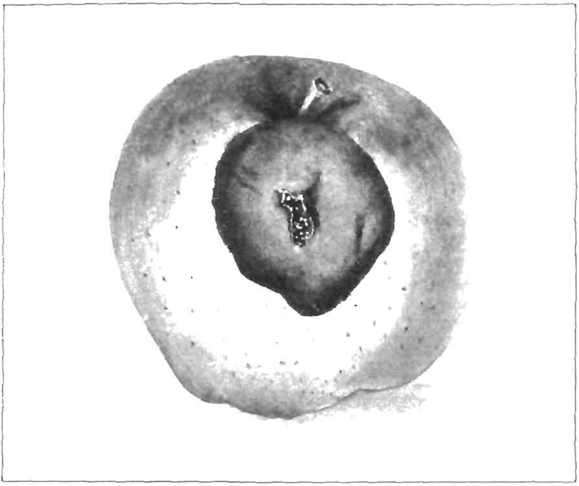


FIG. 1. DECAY OF APPLE RESULTING FROM PUNCTURE.

FIG. 2.—APPLE PACKING SCENE.

APPLE PACKING, CALIFORNIA.

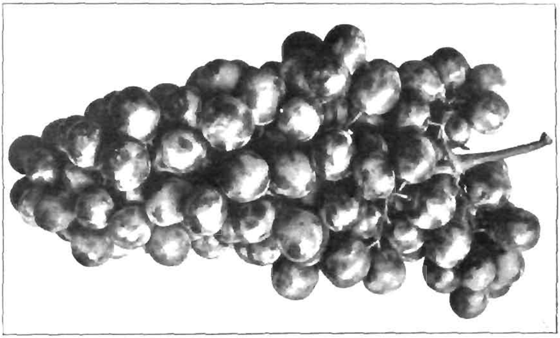


FIG. 1.—UNINJURED CLUSTER.

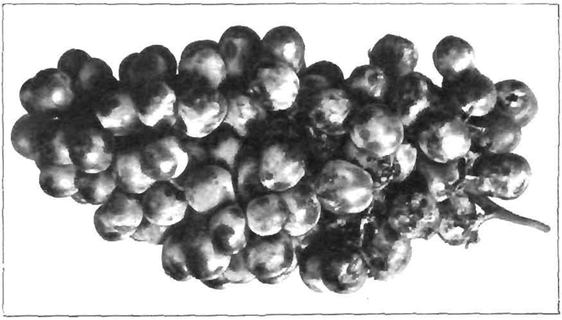


FIG. 2.—DECAY DUE TO BRUISING.

FLAME TOKAY GRAPES, CALIFORNIA.

INFLUENCE OF PRECOOLING ON PEACHES.

[Fig. 1.—Hard ripe Early Crawford peach delivered at New York in sound condition by precooling and ordinary icing. Fig. 2.—Early Crawford peach from California, picked green and shipped to New York under ordinary icing in the usual way.]

AMERICAN LITHOGRAPHIC CO., N.Y.

orchard practices of tilling, fertilizing, pruning, thinning, and spraying. It frequently happens that after a grower has used the utmost care in producing his crop he nullifies all through the handling he gives it in preparing it for market. It does not matter how excellent his orchard practices are, if his fruit does not reach the markets in sound and attractive condition he may find that he receives no more for his crop than a more careless or slipshod neighbor, and he is at a loss to understand why.

During the last eight years the Bureau of Plant Industry has conducted investigations of the factors which govern the shipment and storage of fruits. It has been shown by many experimental shipments that there is a direct relation between the handling and the treatment in all of the various processes of preparing the fruit for shipment and its behavior while in transit or storage. This has to deal with the picking, packing, hauling, and cooling of the fruit.

MECHANICAL INJURIES.

It is generally recognized that fruit must be handled with great care if it is to be kept sound, but few have realized, until it has been demonstrated to them, how easy it is to injure fruit in handling and how much injury is actually being done. In the investigations conducted by the Bureau of Plant Industry it was not uncommon to find 10 or 15 per cent of apples injured by rough handling in picking and packing. Plate XXVII, figure 1, illustrates an apple, showing decay started about a puncture; figure 2 illustrates an apple-packing scene in California. Frequently, also, from 10 to 50 per cent of oranges were found to be injured by the clippers in severing the fruit from the trees or in handling it in the packing houses. Again, from 5 to 40 per cent of table grapes were found to be cracked or broken more or less severely at the pedicels.

The work of the Bureau of Plant Industry has shown that the more common kinds of molds which cause decay in transit and storage have not the power to penetrate the unbroken, normal skin of the fruit. It has been shown that the molds generally gain entrance through mechanical bruises or abrasions of the skin made in the handling of the fruit in preparing it for market. Some common forms of such injuries are bruises and scratches made in the picking of the fruit, in squeezing it and dropping it roughly into picking boxes, bags, baskets, or pails, or in pouring it from the field bag or pail into boxes. Hauling on springless wagons (sleds are sometimes used) may seriously bruise the fruit. Dirt, gravel, dried branches, or twigs in the bottom of the field boxes are also a frequent source of injury. Injuries of these types are not only difficult to detect but offer ideal conditions for the starting of decay. Many fruits are injured by scratches made by the finger nails of pickers and packers.

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In the case of the soft fruits much bruising results from excessive squeezing in packing. The tips of peaches are most delicate and easily bruised or injured. In examining peaches in shipping and storage experiments tip injury is frequently found to be the greatest source of decay

Grapes are perhaps the most easily injured of all fruits. An examination of grape berries shows that from 90 to 95 per cent of the injuries consist of breaks or cracks at the pedicel, the place where the stem joins the berry. Sometimes the bending aside of a berry is sufficient to cause a slight rupture or crack at that point, and all such berries are susceptible to decay when they are packed. This indicates the extreme care with which all handling of grapes must be done. Handling must be reduced to a minimum and always, when practicable, the bunches should be handled by the main stems, for every time a bunch of grapes is lifted there is danger of injury unless it is done with the utmost care. Grapes are often injured in placing them in the baskets—by rough handling, excessive squeezing or crowding, or twisting and binding the long bunches to form compact masses. It has been shown that unbroken grape berries carefully handled and laid in loosely do not decay under normal conditions of shipment, and the nearer the packing can be made to approach this ideal condition the less will be the danger of injury and resulting decay.

Very soft fruits, like cherries or berries, are very easily injured, especially when these fruits are allowed to become over-ripe. It is important to have the picking operations keep pace with the ripening of the fruit. This means going over the cherry trees several times; berry plantations at the height of the season must be gone over daily. The softer or more susceptible the fruit is to injury the more carefully must it be handled throughout all the processes of preparing it for shipment.

During the last two years the transportation investigations of the Bureau of Plant Industry have been extended to the table-grape industry of California. Careful observations on handling methods have been made, and extensive shipping experiments have been carried on in order to demonstrate the results of careful handling in preparing the fruit for market. The experiments consisted of shipping a series of crates and boxes of grapes packed under known conditions through to New York, where the packages were carefully inspected and the actual percentages of decay were determined. The ordinary commercial pack was used in comparison with the same fruit carefully handled by the government investigators. Records on 50 such shipments were obtained during the shipping seasons of 1908 and 1909.

The records of the shipments made in 1909 show an average of 1.2 per cent of decay in the carefully handled lots and 5.8 per cent of decay in the commercial pack of the same fruit. Moreover, this difference was maintained after arrival in New York. The grapes were held for a week under open-market conditions, and determinations of the decay were made three, five, and seven days after arrival. The carefully handled lots were still in merchantable condition five days after arrival, with an average of 5.2 per cent of decay, or less than the average decay found in the commercial packs on the day of arrival. Plate XXVIII, figure 1, illustrates a cluster of Flame Tokay grapes that has been carefully handled and has reached an eastern market uninjured. Figure 2 illustrates a similar cluster that has been bruised, thus giving entrance to decay. The decay in the commercial packs had reached 15.8 per cent five days after being received, and they were far past a marketable condition. The carefully handled lots had a great advantage aside from their better and sounder condition, in that they were in fit shape to be reshipped from large centers to smaller surrounding towns, thus allowing a much wider distribution and extension of the market. The importance of this fact can best be appreciated when considered in connection with the problems of overproduction and the possibilities of increasing the sale and use of the fruit. As long as the commercial packs continue to arrive at or near the limit of decay commercially allowable, the possibilities of reshipment are extremely limited, and the market for the fruit is cut down accordingly.

In the careful-handling experiments with grapes and oranges nothing was attempted which can not be done under commercial conditions. In the case of citrus fruits the piecework system has been changed to the day-payment plan, thus doing away with the tendency to rapid and careless work. In the grape industry no such radical change is necessary, as the day-payment plan largely prevails, but the pickers, packers, and all those who handle the fruit must be impressed with the necessity of doing their several operations with the utmost care. The fault lies largely in requiring as much and as rapid work to be done in a day as possible. Nearly every grower knows or believes that care is necessary, but very few realize how much damage is really due to requiring their help to work at topmost speed in order to get the work done as cheaply as possible. In many instances growers are astounded when informed of the amount of injury which is done. In the hurry and anxiety to get off as much as possible and to hasten all operations the bruises, the scratches, and the punctures which result are too often overlooked.

Naturally it will cost more to handle the fruit carefully At first sight it seems unreasonable to advocate spending more money in

preparing fruit for market during seasons of low prices, but it has been found to be good business policy to make the increased expenditure. The saving in the quantity of sound fruit gotten to market will alone very nearly balance the increased cost. Using the average percentages of decay in the carefully handled and the commercial packs of grapes already noted, the saving in favor of careful handling amounts to nearly forty-five crates per car, or a full carload of grapes for every twenty-one shipped, and this does not take into consideration the increase in market value and consequent salability of the sounder fruit, the price of fresh fruit being always depreciated by the presence of decay.

What has been found to be true in the grape industry applies with equal force to all other branches of fruit growing. Sound fruit of good quality, honestly and uniformly graded and packed, is the fundamental factor upon which the success of the business depends.

REFRIGERATION.

Another factor of prime importance in the successful shipping of fresh fruits long distances is quick and efficient refrigeration. The deciduous fruits are all shipped during warm weather and must be kept cool while in transit. The full transcontinental trip requires usually from twelve to fourteen days, which may be comparable to a period of about two weeks in cold storage.

As already stated, it has been found that the ripening processes are hastened when the fruit is picked. The development of molds also goes on at a rapid rate while the fruit is warm. Reducing the temperature retards the ripening and prevents the development of the molds. The length of time that the fruit will remain in good condition depends upon the promptness and the thoroughness with which it is cooled.

Careful records made of many deciduous-fruit packages show that the temperatures of the packed fruit during the greater part of the season are extremely high. The range runs from 80° to over 100° F., and the average of all temperature records made is between 90° and 95° F. At such temperatures the fruit ripens very fast and decay and deterioration are extremely rapid, especially if the fruit has been roughly handled and injured to any great extent.

Records made in refrigerator cars show that the rate of cooling in the fruit package is very slow when the ice of the car is depended upon both to reduce the temperature and to hold it low. It frequently happens that several days elapse before the fruit is cooled sufficiently to retard ripening and decay. This is the main reason why the Pacific-coast fruits are picked so long before they have acquired full quality. When they are not picked green, they become over-ripe and soften

before the ice of the car has a chance to reduce the temperature below the danger point.

Frequently a very distinct advantage may be gained by allowing the fruit to remain open overnight and packing while it is cool in the morning. More cooling can usually be obtained in this way than in one or two days in the refrigerator cars after the fruit is packed, especially where it is wrapped in paper. This is particularly true for grapes, and many growers and packers take advantage of it. It has been asserted that before a system of overnight cooling was adopted it was impossible to ship peaches and plums in sound condition from some of the interior points of the San Joaquin Valley of California.

During the last eight years the Bureau of Plant Industry has conducted investigations of different methods of quickly cooling fruits before shipping. This practice, which has for its object reducing the temperature as quickly as possible, has been designated "precooling." Under this system the ice of the refrigerator car is not expected to cool the fruit, but only to keep it cool during the trip across the continent.

Precooling is usually done by mechanical means after the fruit is packed, either in a warehouse or a cold-storage plant before loading on the cars or after loading by forcing large volumes of very cold air through the cars, thus reducing the temperature of the fruit much more rapidly than can be done with ice alone. Precooling may also be done before packing, and when this is practicable it is comparatively easy, because there is a chance for the circulation of the air around the fruit. The disadvantage of such a system is that the packing has to be done in cool rooms to avoid the condensation of moisture on the cold fruit.

The best system of precooling, whether in cars or in warehouses, has not yet been definitely determined, although two of the great transportation companies of the Pacific coast are erecting mammoth plants to precool in the cars all the fruit shipped over their lines. One great disadvantage of this system is the delay which must necessarily ensue in assembling the cars from the different districts. Much of the beneficial effect from precooling will be lost unless the work is done as soon as possible after the fruit is packed. A delay of even twelve hours during warm weather may very seriously affect the results.

Another disadvantage in car precooling is the great difficulty or impossibility of so distributing the air that every package will be reached. Under the best conditions some of the packages will be cooled very much more quickly than others, depending upon the method of applying the air.

Precooling in a warehouse or cool room consists in placing the fruit in a refrigerated room, with sufficient piping to keep the room tem-

perature well below the desired point until all the packages are thoroughly cooled. The packages may be so stacked that a thorough circulation is possible, resulting in greater uniformity in the cooling than is the case in the closely packed car.

One disadvantage of having the precooling done in warehouses is the expense of building and maintaining the necessary plants, and this must be borne by the shipping companies, growers' associations, or individual growers. Under this system the expense and responsibility fall on the shipper, while under the car-precooling system the transportation companies bear the burden. However, the transportation companies must require that the fruit be delivered to them in sound condition and fit for shipment, and whether the placing of the packages in proper condition for safe shipment should include the reduction to a proper and safe temperature is an open question.

The advantages of precooling in the handling of deciduous fruits are manifold. The first and most important of these is the fact that, if precooled, the fruit may be left on the trees to attain a greater degree of maturity, thus assuring a much better quality. It has been shown that the soft fruits, like plums, peaches, and apricots, may be allowed to remain until they reach a hard-ripe condition and may then be shipped long distances without deterioration. Plate XXIX, upper figure, illustrates an Early Crawford peach that was allowed to reach the hard-ripe stage before picking, which, by being precooled, was shipped to New York in sound condition. Plate XXIX, lower figure, illustrates the condition of peaches shipped commercially at the same time. In both cases the illustration shows the condition of the fruit on arrival at its destination. In the case of cherries and berries, precooling will enable the crop to be shipped greater distances, thus assuring wider market distribution and more satisfactory condition on arrival.

Precooling is now recognized as one of the important factors in the safe shipping and handling of highly perishable products, and its use will be extended as its advantages and application are better understood. It should never be used as a means to overcome difficulties arising from improper or rough handling. Used as a means to insure safe shipment after the grower and packer have done their share, precooling is both valuable and legitimate. Used as a means to overcome the effects of rough handling, precooling only retards decay and deterioration for a time, and the troubles develop when the fruit warms up after arrival in the market.

PROMISING NEW FRUITS.

By William A. Taylor,

Pomologist in Charge of Field Investigations, Bureau of Plant Industry.

Interest in new fruits varies greatly in different sections and at different times in the same section. Where the commercial production of certain types has become firmly established such interest usually lags so long as the established types continue to do well and to meet with good demand in the markets. When such sorts suffer from unusual or untimely climatic conditions or prove susceptible to injury by diseases or insects not previously encountered, however, interest is at once aroused and the need for varieties superior in one or another important characteristic is at once realized. In such case the community which has within its borders a fruiting collection containing the newer sorts is fortunate through its ability to gain quickly the desired information regarding the adaptability of such sorts.

Every large commercial orchard enterprise should in fact maintain a carefully selected varietal collection merely for the information to be derived regarding the behavior of varieties, against the possibility of needing to top-work blocks of some of the older sorts. For notwithstanding the importance of cultural methods, including spraying, and of skill in handling and marketing the product, the fact remains conspicuously evident that the inherent characteristics of varieties and their proper adjustment to environment are factors of fundamental importance in successful orcharding.

The "newness" of varieties is, in a country like the United States, at best but a relative term. Sorts thoroughly tested and proved either successes or failures in one section are still unknown in other parts. Hardly a season passes without bringing to light some old eastern variety that has found a congenial home farther west or south than its previously proved region of adaptability. Some such sorts have accordingly been included in the series of articles on this subject which began in the Yearbook for 1901, in order that the attention of fruit growers may be called to such of them as are worthy of testing in an experimental way. The commercial fruit grower should of course bear in mind that these are not recommended for extensive planting outside of the localities where they have already proved their adaptability, but that they are suggested as promising for trial. With most of the tree fruits several fruiting seasons are required to determine whether a new sort is worthy of commercial planting in a locality.

MOTHER APPLE.

SYNONYMS: *American Mother, Gardner's Apple, Queen Anne.*

[PLATE XXX.]

This choice early winter apple, though hardly entitled to designation as a new sort, is being found adapted to a much wider climatic range than has previously been thought possible.

The exact time of its origin is not known, but it appears to have originated on the farm of Gen. Stephen P. Gardner, of Bolton, Mass., rather early in the last century. The first public notice that it received appears to have been in 1844, when Hovey reported it as having been exhibited before the Massachusetts Horticultural Society the preceding autumn.[a]

At the North American Pomological Convention held in Buffalo in September, 1848, it was decided to be of "first-rate character," and a description and outline of the variety were published in the account of that meeting for that year.[b] The first adequate description and outline of the variety were published by Hovey[c] in 1849. With five other varieties it was listed by the American Pomological Society in 1852 in a group of "New Varieties which Promise Well," and it appears to have quickly attained high reputation as a dessert apple. The small size of tree, earliness of ripening season, and the relative susceptibility of the fruit to apple scab appear to have held it out of the market lists until recently.

DESCRIPTION.

Form roundish oblong to oblong conic, indistinctly ribbed; size large; cavity regular, small to medium in size, moderately deep, with gradual slope and russet markings; stem short, moderately stout; calyx segments small, converging; eye small, closed; surface moderately smooth, rather dull, rarely glossy; color rich yellow, washed with mixed red and striped with crimson; dots numerous, small to medium in size, brown and yellow; skin moderately thick; core rather large, roundish, clasping, open; calyx tube rather deep, varying from funnel shaped to cylindrical; seeds small, plump, brown, numerous; flesh yellowish, fine grained, crisp, and juicy; flavor mild but distinctly subacid and rich, with a characteristic aroma which distinguishes it from other sorts; quality very good. Season, November to January in the northern winter apple regions, but becoming a late fall apple farther south.

Like some other sorts that have long been known and somewhat planted in the northern winter apple districts chiefly as home orchard

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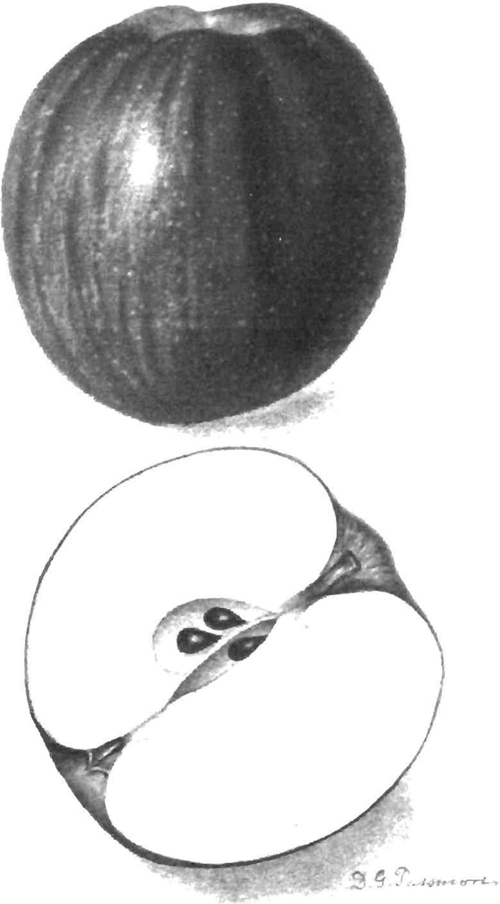
[a] Magazine of Horticulture, 1844, p. 210.

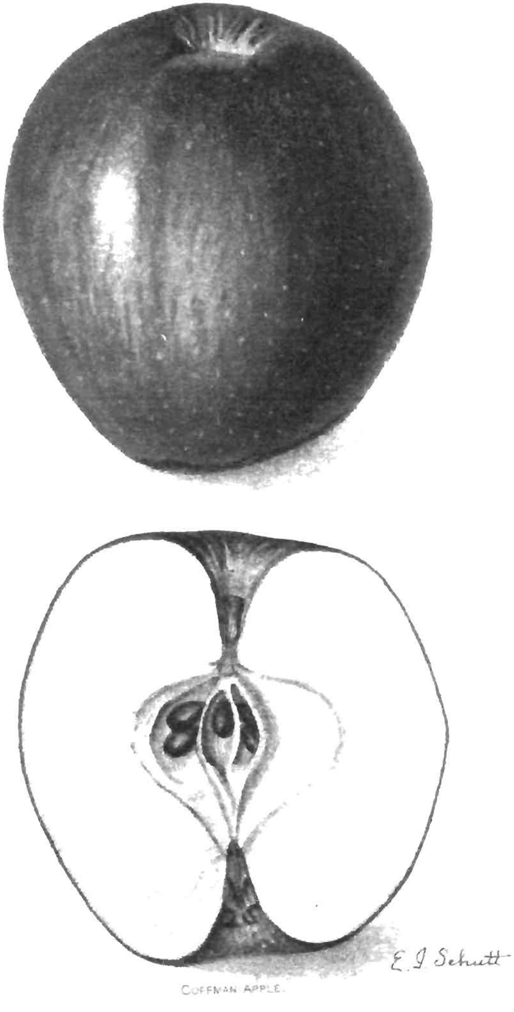
[b] Transactions of the N. Y. State Agricultural Society for 1848, p. 281.

[c] Magazine of Horticulture, January, 1849, p. 65.

PLATE



MOTHER APPLE.



COFFMAN APPLE.

varieties of high quality, the Mother in recent years is attracting attention as a commercial sort.

The tree is but a moderately vigorous grower and does best on more vigorous stocks. Its behavior farther south (as recently observed) indicates an adaptability to Appalachian conditions not previously recognized, so that it appears worthy of testing in all districts where varieties like Baldwin and Esopus succeed, to which it is evidently rather closely related.

Its behavior under modern cultural methods indicates its adaptability to conditions as widely different as those of New England, eastern New York, North Carolina, western Michigan, and portions of Washington. *When planted commercially the fruit would* undoubtedly need to be handled in special trade.

The specimen illustrated in Plate XXX was grown by Mr. J. W. Van Deman, Benzonia, Mich.

COFFMAN APPLE.

SYNONYMS: *Koffman June, Summer Red.*

[PLATE XXXI.]

This very promising early apple has long been grown in western Tennessee, where it was propagated by "sprouts" from an old tree on the farm of Mr. W. L. Coffman, in Lauderdale County, as early as 1855.[a] Though apparently not much propagated in nurseries of that section it appears to have been considerably distributed throughout western Tennessee, northern Alabama, and to some extent in Arkansas before its formal introduction to the nursery trade by Mr. B. A. Craddock about 1888. Its close resemblance to Red June (synonym, *Carolina Red June*) gives ground for the belief that it is a seedling of that well-known old sort. It was described without illustration by Heiges in 1895[b] and the evidence of its wide range of adaptability to southern conditions accumulated since that time indicates that it is at the present time one of the most promising early varieties for both home use and market in the South.

DESCRIPTION.

Form oblong to oblong conic, often slightly oblique and tapering toward base; size medium to large; cavity small to medium, deep, abrupt, marked with russet; stem very short, rather stout; basin of medium size, regular, deep, abrupt, marked with shallow furrows and somewhat downy; calyx segments long, narrow, converging, reflexed at tip; eye small, closed; surface smooth, glossy; color pale

[a] Letter from Mr. B. A. Craddock, Curve, Tenn., 1895.

[b] Report of Pomologist for 1895, p. 21.

yellow, washed over practically the entire surface with mixed red, striped with dark purplish red, and thinly overspread with gray; dots numerous, small, gray and yellow; skin rather thick and tough, tenacious; core small, conical, very open, meeting the eye; calyx tube long, large; seeds of medium size, plump, brown, rather numerous; flesh yellowish, tinged with red, rather fine grained, breaking and rather juicy; flavor sprightly subacid; quality good to very good. Season, June and July, in Hardman County, Tenn.

The tree is a vigorous and upright grower, with reddish-brown bark on the young wood. It is reported to be abundantly and regularly productive, the original tree not having missed a crop in thirty years

The reviving interest in summer apples for commercial planting renders this variety of the Red June group well worthy of the attention of planters south of the Ohio and Potomac rivers. It appears to possess all the merits of the Red June coupled with larger size and better carrying quality.

The specimen illustrated in Plate XXXI was grown by Mr. J. M. Morris, Grand Junction, Tenn

DIPLOMA CURRANT.

SYNONYM: *Moore's No. 180.*

[PLATE XXXII.]

This promising sort was grown in 1885 by the late Jacob Moore, of Brighton, N. Y., as a seedling of the Cherry currant, the blossoms of which had been fertilized with pollen of the White Grape currant during the previous season Fruit of it was submitted in 1896 by Mr. Moore to the Department for examination under its provisional designation "No. 180," and in 1897 Mr. Moore named it Diploma. It was formally introduced to cultivation in 1906 by Mr. Charles A. Green, of Rochester, N. Y.

The originator, who grew a large number of seedling currants, considered it his largest fruited variety, averaging larger in size than its parent the Cherry and outyielding that variety under the same conditions and treatment, while at the same time milder in acid and of better quality than that sort.

DESCRIPTION.

Racemes short to medium in length and rather slender, carrying from 5 to 8 berries each; berries globular, large to very large, on pedicels of moderate length, to which they adhere rather tenaciously; corolla brown, small, tenacious; surface smooth, glossy; color bright, rich, crimson, not fading quickly after picking, with narrow yellow veins and showing the seeds through the translucent flesh and skin; seeds rather large, numerous, and rather woody; flesh reddish,

translucent, moderately firm but tender, abundantly juicy but of fair shipping quality; flavor sprightly subacid; quality good to very good. Season, the second half of July, at Rochester, N. Y.

Wood and foliage similar to Cherry, but more vigorous than that variety.

A promising sort for both the home garden and the market plantation.

The specimen illustrated in Plate XXXII was grown by Green's Nursery Company, Rochester, N. Y.

CARRIE GOOSEBERRY.

(PLATE XXXIII.)

While the gooseberry has not yet attained the standing as a home garden or market fruit in the United States that is accorded to it in some of the European countries, especially the United Kingdom, there are few fruit gardens in the Northern States where it is unrepresented, while in some sections it has become an important market fruit. The failure of the highly developed European varieties to endure our more intense and variable climatic conditions is doubtless the explanation of the general lack of interest among American growers, which is indicated by the very small number of American varieties that have appeared thus far. Hardly more than a half dozen such sorts, including Houghton, which originated in 1833, and Downing, about 1854,[a] have as yet established their value as desirable sorts. A few of the European sorts when given special care and attention have been found fairly successful, one of the most conspicuous of these being Industry, which was introduced into the United States by Ellwanger & Barry about 1883. Seedlings are still being grown, however, and some systematic breeding work is being done that promises to yield varieties better adapted to the conditions prevailing in particular districts than any yet disseminated, both as regards disease resistance, cold endurance, and productiveness. One of the most promising of those recently disseminated is the Carrie, which originated as a seedling of Houghton, grown by Mr. Wyman Elliot, of Minneapolis, Minn., in 1893. It was one of some 700 seedlings that resulted from a supposed cross of Industry, of which one bush stood adjacent to the mother Houghton bush. In the spring of 1894 the seedlings were removed to the farm of Mr. Thomas Redpath, near Lake Minnetonka, where one bush was soon discovered to be superior to all the others in several important particulars. This, which was the original Carrie, bore some fruit the first year after transplanting, and at 4 years of age produced 8 quarts of berries. Having good foliage and being of vigorous growth, and having maintained regular productiveness without showing any winter injury, its commercial

[a] Magazine of Horticulture, 1857, p. 516.

introduction was decided on in 1903, and its propagation by layers and cuttings was begun in that year. The variety was named Carrie in honor of Mrs. Redpath, and was introduced in 1905 by Elliot and Redpath.

DESCRIPTION.

Berries borne singly or in pairs or triplets with occasionally 5 in a cluster; size medium, though sometimes large; form roundish oval with an unusually long, meaty shank at the base; pedicel very slender, rather tenacious; corolla rather small, adherent; surface smooth, glaucous; color greenish, changing to purplish red on the exposed side, and conspicuously veined with white; flesh greenish, translucent, rather firm, fine grained, pulpy, juicy; flavor a pleasant subacid; quality good to very good. Wood long, rather slender, willowy; very productive; foliage large, thick, glossy, free from disease.

Recommended for the upper Mississippi Valley and other sections having severe winters and hot summers.

The specimens illustrated in Plate XXXIII *were grown by* Elliot and Redpath, Minneapolis, Minn.

WINFIELD RASPBERRY.

[PLATE XXXIV.]

The original plant of this promising blackcap was found in June, 1902, as an accidental seedling in a grape arbor in the garden of Mr. G. F. Kleinsteiber, in Winfield, Kans. Mr. Kleinsteiber was strongly inclined to destroy the stray seedling as a weed, but his wife induced him to retain it until after it should fruit. The plant proved a vigorous grower and matured a strong cane which grew out through the side of the arbor and, true to the habit of its species, struck root at its tip in the soil outside. The handsome color, large size, and fine quality of the crop when it fruited encouraged Mr. Kleinsteiber to propagate it for his own planting and it soon attracted the attention of others, with the result that the Winfield Nursery Company introduced the variety in 1909.

Nine plants of it in the garden of Mr. Kleinsteiber yielded 54 quarts of berries in one season when the crop of Kansas raspberry beside it was destroyed by frost, while in 1908 he sold $40 worth of fruit from a plot 32 by 95 feet in his garden at an average price of $3.50 per crate of 24 boxes in addition to 60 boxes of fruit used at home.[a]

DESCRIPTION.

Berries roundish oblate, large to very large, borne in a compact cluster of from 10 to 16 fruits, sometimes having 1 or 2 isolated lower

[a] Information furnished by Mr. Kleinsteiber, July, 1909, through Mr. H. P. Gould, Pomologist in Charge of Fruit District Investigations.

DIPLOMA CURRANT.

CARRIE GOOSEBERRY

berries; drupes large, fleshy, glossy, black, with heavy bloom, adhering rather closely to the receptacle; seeds small; pedicels slender, thorny; calyx of medium size; flesh dark purplish red or black, firm and meaty but juicy and tender; flavor subacid with pleasant aroma; quality good to very good. Season, early June in Cowley County, Kans.

The bush is a strong, vigorous grower, apparently hardy and worthy of planting wherever the blackcaps succeed, especially in the prairie region, where many of the eastern varieties fail.

The specimen illustrated in Plate XXXIV was grown by the Winfield Nursery Company, Winfield, Kans.

VICTOR ROSELLE.

[PLATE XXXV.]

The roselle, *Hibiscus sabdariffa* Linn., though native to the Old World Tropics, has long been sparingly introduced to the West Indies and elsewhere in tropical America. It was reported in Jamaica as early as 1707 [a] by Hans Sloane, who stated that it was planted in most gardens of that island, where "The capsular leaves are made use of for making Tarts, Gellies, and Wine, to be used in fevers and hot distempers, to allay heat and quench thirst." In Florida, where the date of its introduction, though unrecorded, is evidently recent, it is very commonly known as "Jamaica Sorrel," and in parts of tropical America, notably the Canal Zone, it bears this name, indicating the Jamaican channel through which the species was probably distributed in the New World. Notwithstanding its long recognition as a valuable plant in both the Old and the New Worlds, little attention appears to have been paid to the development of improved strains until recently. In fact, so far as known the Victor is the first variety or race to be dignified with a varietal name. This is probably due to the fact that in India, as has been stated by Wester,[b] the species, though recognized as possessing edible qualities, has chiefly been grown as a fiber plant rather than for its edible calyces, the portion prized in the American Tropics. As the plant is a tropical annual requiring at least six months of warm weather free from frost to bring it up to the beginning of its harvest period and about two months more to mature its full crop, its chief interest to American planters will be in southern Florida and frost-free localities in California, together with Porto Rico, the Canal Zone, Hawaii, and the Philippines. Its luxuriant growth and great productiveness may render it sufficiently profitable in some sections where frost occurs too early to permit its seed to ripen, however. It appears not improbable that earlier

[a] Natural History of Jamaica, 1707, vol. 1, p. 224.
[b] Farmers' Bulletin 307, p. 9.

maturing varieties may yet be developed which may be adapted to a considerable portion of the cotton States.

The Victor was originated at Miami, Fla., by Mr. P. J. Wester, Special Agent in the Bureau of Plant Industry. Having obtained a few plants of the common roselle in 1904 from Mr. W. A. H. Hobbs, of Cocoanut Grove, for planting in the Subtropical Garden at Miami, Mr. Wester observed marked variation among them and began selecting seed from those bearing the largest calyces and showing other desirable characteristics, with the result that in the second generation of plants (1906) the strain was considered fixed and has so continued.

DESCRIPTION.

Mr. Wester's characterization of the Victor is as follows:[a]

"The plants of the Victor variety are inclined to be a trifle more dwarf than the common kind, but the foliage is similar. The measurements of the calyx of the common variety are: Length 33 mm., diameter 22 mm.; in the improved type the measurements are 49 mm. and 28 mm., respectively. The increase in size is thus seen to be rather more in length than in diameter. Calyces of the improved type have in some instances been 60 mm. long and 38 mm. in diameter. The improved type is also distinct in being more strongly ribbed longitudinally and in having the calyx not so closely appressed to the seed pod as in the common variety. It is frequently inclined to be convolute at the apex."

As a tropical plant yielding a quick return in the form of a sauce, jam, and jelly producing fruit, closely resembling in quality the cranberry of the North, the Victor is worthy of testing wherever the common roselle has been found to succeed. To obtain the highest yield of large calyces, the seeds are planted in southern Florida about May 15. The young seedlings are transplanted to the field when 3 or 4 inches high, and begin blossoming late in October. The first fruit is gathered about the middle of November and should be harvested as rapidly as it reaches suitable size in order to insure continuance of blossoming and fruiting until late in February.[b]

The specimens illustrated in Plate XXXV were grown at the Subtropical Garden at Miami, Fla.

PECAN VARIETIES.

[PLATE XXXVI.]

The numerous pecan orchards that are now attaining bearing age in the Southern States emphasize the fact that it is of the utmost importance that commercial planters of this nut should exercise

[a] Farmers' Bulletin 307, p. 10.

[b] Full details regarding the culture, yield, uses, and other important points of roselle will be found in Farmers' Bulletin 307.

great care to secure varieties adapted to the conditions of the section where they are to be planted. While trees of varieties that prove unsuited to conditions can be top-worked and converted into other sorts, the expense of such conversion and the time required to accomplish it render it important that the necessity for such top budding and grafting be avoided if possible. Careful investigation of the behavior of varieties already growing in a locality or under conditions as similar as can be found is the only safe course for the pecan planter in selecting his varieties. While nothing short of actual test of a variety in the locality can be considered sufficient, in the absence of such test the *grower will do well to confine his commercial plantings* to varieties that have originated in his own region, rather than to rely on sorts that have been developed under radically different climatic conditions.

BRADLEY PECAN.

The original tree of this variety was grown from a Frotscher pecan planted about 1886 at Macclenny, Fla., by Mr. D. C. Griffing. It bore its first nuts in 1892, and its precocity and productiveness, coupled with its early ripening season, caused its owners to begin the propagation of it about 1896. It was catalogued and introduced in 1898 by the Griffing Brothers Company. The original tree has been heavily cut for scions, so that no very accurate determination of its productiveness has been possible, but it is reported to have borne well and regularly up to 1907, when it yielded nearly 200 pounds of nuts. Since then the crop has been light.

DESCRIPTION.

Form long, oval to cylindrical, somewhat compressed, with a rather long, pointed base and long, angular apex; surface smooth; size medium, 65 to 80 nuts to the pound; color bright grayish brown with dark reddish black markings near apex; shell thin, rather hard, cracking easily and releasing kernel readily; kernel brownish, plump, considerably corrugated and broadly grooved; texture firm, compact; flavor sweet; quality very good. Season early.

The tree resembles its parent, the Frotscher, considerably, is a vigorous grower, of erratic, spreading habit, with narrow, thin foliage and carrying its fruit spurs well through the tree. The young wood is smooth and brown, with numerous large, light dots.

Under favorable conditions the young trees are very vigorous and productive, some in Thomasville, Ga., about 7 years old having been observed in 1909 breaking down with their load of nuts.[a]

The specimens illustrated in Plate XXXVI were grown by Mr. R. S. Heeth, Thomasville, Ga.

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[a] Reported by Mr. C. A. Reed, Special Agent, September, 1909.

Claremont Pecan.

The original tree of this variety is a seedling about thirty years old on *Pecania (formerly Claremont) Plantation near Ferriday*, Concordia Parish, La. The tree, which is isolated from others of its species, began bearing about 1895 and has borne regularly and heavily each year since. The crop of 1908 totaled nearly 450 pounds. That of 1909 was considerably lessened by a severe storm in September, but amounted to about 350 pounds. The variety was named Claremont in 1907 by Prof. H. E. Van Deman when its propagation was begun.

Description.

Form roundish ovate, with flattened base and short, blunt apex; size medium, 55 to 75 nuts to the pound; color dull grayish brown with numerous purplish markings toward apex and scattered flecks over general surface; shell moderately thick and rather hard, but cracking easily and releasing kernel exceptionally well; kernel plump, slightly corrugated and broadly grooved, of a pale yellowish color; texture compact; flavor sweet; quality good to very good. Season medium.

The tree is a strong, symmetrical, upright grower with fruit spurs well distributed, bearing clusters of from 1 to 8 nuts, usually 3 or 4. The young wood is smooth and brown, with stubby, hairy buds. Though not yet fruited except on the original tree, the variety is apparently promising for the lower Mississippi Valley.

The specimens illustrated in Plate XXXVI are from the original tree on Pecania Plantation at Ferriday, La.

Halbert Pecan.

The Halbert pecan was discovered as a wild tree in a grove near Coleman, Tex., by Mr. H. A. Halbert in 1886. Shortly after this Mr. Halbert took possession of the land on which the tree stood and began disseminating the variety in the form of nuts. It was named Halbert by him about 1901,[a] and on December 10 of that year[b] was awarded the first premium in a pecan competition at Waco, Tex., for the best pound of pecans exhibited.

The first propagation of the variety by budding was by Mr. Halbert in 1901.

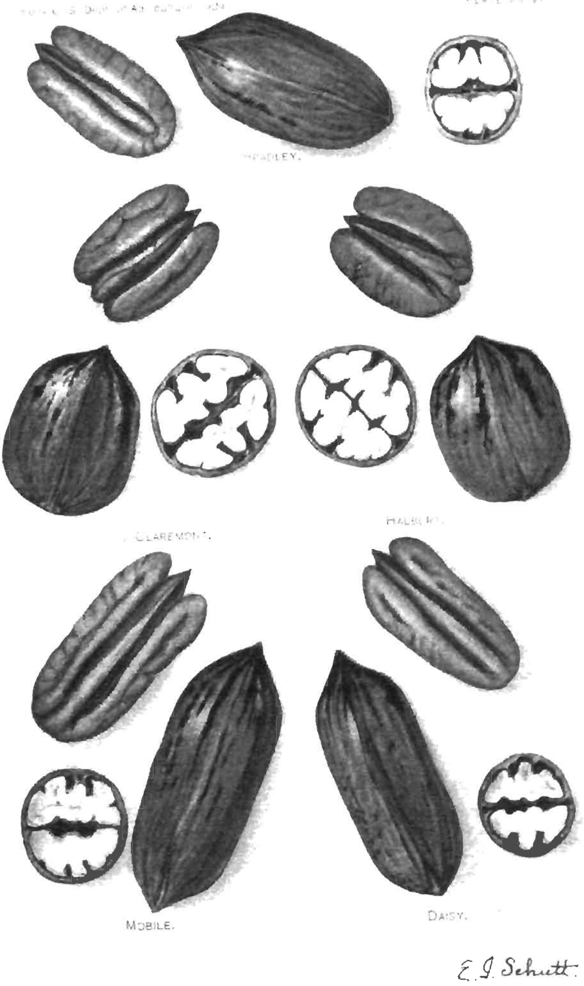
Description.

Form short, roundish oval, compressed, with blunt base and very short, blunt, quadrangular apex; size medium, 65 to 70 nuts to the pound; color rather dull reddish brown with reddish black markings; shell very thin and rather brittle; cracking quality excellent, releas-

[a] Letter from Mr. H. A. Halbert, January 29, 1902.
[b] Texas Farm and Ranch, December 28, 1901, p. 13.

WINFIELD RASPBERRY.

D. G. Passmore



PECAN VARIETIES.

ing the kernel easily and completely; kernel bright, very plump, deeply grooved; texture firm, oily; flavor sweet; quality very good.

The tree is described as of willowy growth, with slender, long-jointed wood. It is reported to be a very heavy bloomer, with fruiting clusters of 3 to 5 nuts, with sometimes as many as 8. Mr. Halbert reports that it has borne 22 crops during the twenty-three years he has had the tree under observation.

The specimens illustrated in Plate XXXVI were grown by Mr. H. A. Halbert, Coleman, Tex.

MOBILE PECAN.

SYNONYMS: *Laurendine, Batey's Perfection.*

The Mobile pecan appears to have originated as a seedling from a planted nut at Bayou Labatre, Ala., about 1887. Though early attaining a high reputation locally, it does not appear to have attracted attention elsewhere nor to have been propagated by budding and grafting until about 1900,[a] when it was propagated by F. H. Lewis and I. P. Delmas, of Scranton, Miss. About 1904–5 it was propagated by Mr. John B. Davis, of Mobile, Ala., and B. W. Stone & Co., of Thomasville, Ga. The variety was catalogued and disseminated as the Mobile by the Stone Nursery in 1904–5, though it had been locally known at Bayou Labatre under the name *Laurendine* for some years. Later it was somewhat disseminated by Mr. C. C. Batey as *Batey's Perfection*, under which name it is found in a number of orchards in Georgia. The original tree is reported to be a heavy bearer of large nuts, one crop having attained a total of 400 pounds. For several years past the crop on the original tree has shown a large proportion of faulty kernels.

DESCRIPTION.

Form long, cylindrical, four-angled, sometimes constricted at the middle and obovate; base pointed, apex conspicuously four-angled, surface often lumpy; large, 55 to 65 nuts to the pound; color bright yellowish brown with narrow purplish black markings toward apex; shell very thin, with thin and soft partitions, cracking easily and releasing kernel readily; kernel long, slender, broadly and deeply grooved, considerably corrugated, and not always plump at the tip; texture rather coarse; flavor sweet; quality good.

The specimens illustrated in Plate XXXVI were grown by Mr. F. H. Lewis, Scranton, Miss.

DAISY PECAN.

The Daisy pecan was originated about 1881[b] by Mr. F. R. Wagenfuehr, of New Braunfels, Tex., as one of 20 seedlings grown by him

[a] Letter from Mr. F. H. Lewis, February 17, 1910.

[b] Letter from Mr. Otto Locke, February 18, 1910.

from nuts obtained on the Guadalupe River bottom. Of these about 12 survived and attained bearing age. The Daisy began bearing about 1896 and is reported to have borne good crops regularly since.

Seedlings grown from the nuts of this tree appear to have been distributed under the name Daisy for several years prior to its dissemination in 1900 by Otto Locke, of New Braunfels, Tex., in the form of scions for grafting. It appears to have been grafted first in 1900[a] by Mr. J. F. Lyendecker, of Frelsburg, Tex.

DESCRIPTION.

Form long, cylindrical, compressed, with rounded base and blunt apex; size medium to large, 55 to 75 nuts to the pound, varying considerably in different seasons; surface rather lumpy; color reddish brown with a few splashes of purplish black near apex and small flecks of similar color generally over the surface; shell moderately thin, cracking easily but clinging rather tightly to the kernel; kernel bright yellow, plump, glossy, broadly grooved; texture rather brittle; flavor sweet; quality very good.

The tree is of vigorous, upright, spreading growth, with smooth, stocky, greenish-brown young wood, with large buds and large dark-green foliage.

The productiveness of the original tree has not yet been very satisfactorily determined, as it has been crowded by other trees in close proximity, but the apparently vigorous growth of young grafted trees and its entire freedom from pecan scab in the East thus far renders it a promising sort.

The specimens illustrated in Plate XXXVI were grown by Mr. Otto Locke, New Braunfels, Tex.

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[a] Letter from Mr. Otto Locke, February 18, 1910.

HOW FARMERS MAY UTILIZE THE SPECIAL WARNINGS OF THE WEATHER BUREAU.

By Charles F. von Herrmann,
Section Director, Weather Bureau, Atlanta, Ga.

THE WEATHER BUREAU AND THE INFORMATION IT FURNISHES.[a]

The operations of the Weather Bureau are based entirely on observations of the weather taken at the same moment of time at about 200 observatories throughout the United States, and telegraphed daily to the central office at Washington, D. C., and to many important cities throughout the country. These observations, comprising barometric pressure, temperature, precipitation, winds, and clouds, are entered upon outline charts of the United States by means of suitable symbols, forming the "daily weather map," from which the forecasts are made. By far the most important work of the service is the issue of the daily forecasts of the weather for every State in the Union, as well as special warnings of storms or hurricanes, of frosts, cold waves, heavy snows, and floods whenever circumstances require them.

The morning forecast, which is the most important and receives the widest distribution, can not be given to the public much before 10 a. m. (seventy-fifth meridian time), since it is based on the 8 a. m. observation, and about two hours are required for the transmission of the telegrams from points covering so wide an extent of territory as the United States, and for the preparation of the charts and forecasts. *The morning forecast covers the period ending at 8 p. m. of the following day. The special warnings are usually issued from twenty-four to thirty-six hours in advance, though flood warnings for important cities near the lower courses of the larger rivers are sometimes issued a week or more in advance.* Besides the main office at Washington, subordinate forecast centers exist at Chicago, New Orleans, Denver, San Francisco, and Portland, Oreg.

Every possible means is taken to distribute the forecasts and warnings as promptly and as widely as possible. They are first telegraphed to about 2,300 principal distributing points, whence they are

[a] The description of the operations of the Weather Bureau is necessarily very brief. The Yearbooks of the Department of Agriculture contain several articles on this subject. (See "The Weather Bureau," by Willis L. Moore, Chief of Bureau, in the Yearbook for 1897; "The Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation," by F. H. Bigelow, Yearbook, 1899; "Weather Bureau Stations and their Duties," by James Kenealy, Yearbook, 1903.)

further disseminated by telegraph, telephone, and mail (forecast cards, rural free-delivery slips, the weather map, and largely through the medium of the daily newspapers). The rural telephones and the rural free-delivery service are the means whereby weather information may best be placed promptly in the hands of the agriculturists; any farmer who is in communication by telephone with a central exchange should be able to have the information telephoned to him daily without cost. Indeed, many farmers have installed telephones in their homes chiefly to be able to obtain the forecasts. In 1907 there were more than 1,600 telephone companies cooperating with the Weather Bureau in the distribution of the weather forecasts. In addition, the distribution by railway telegraph lines and railroad train service reaches nearly 3,000 places. The number of post-offices or addresses receiving the forecasts by weather maps and cards in 1908 was 76,154, and by rural free-delivery slips, 58,008. Probably the total number of persons in the United States to whom the weather forecasts are available is more than 4,000,000 and is increasing. Besides this, all the daily newspapers carry the weather predictions and important weather information.

In Florida and other States the railways make a very effective distribution of cold-wave warnings by sounding four long blasts from the engine. The whistle thus gives prompt warning to farmers several miles distant from the railway. Often steamers on rivers display the cold-wave flag with great advantage to farmers living near the streams.

Other important information collected by the Weather Bureau is made public through the medium of published reports, such as the Cotton-Region Bulletin, issued at many subordinate stations, which gives the temperature and precipitation in the cotton belt during the growing season; a similar Corn-and-Wheat Region Bulletin, covering the immense grain interests in the Northwest; and the National Weekly Weather Bulletin, giving the weather conditions for the growing crops of the entire country in a weekly summary. The statistical data comprising the climatic history of the United States will be found in the Monthly Weather Review and many special bulletins; among the latter, Professor Henry's "Climatology of the United States" may be mentioned as an example of those of special value to agricultural interests. Complete climatological data for every State in the Union up to July 1, 1909, will be found in the monthly and annual reports of the climatological sections, forty-four in number.

Such, briefly, is the nature of the information made available to the public through the operations of the Weather Bureau. The farmer who happens not to be receiving the forecasts and warnings and who desires to share the benefits derived therefrom may communicate directly with the Chief of Bureau at Washington, D. C., or with the

nearest Weather Bureau office. In nearly every State one important station is designated a "section center" and has general control of operations in that State. The farmer should write to his section center, stating his needs; a courteous reply will invariably be received, and if possible arrangements will be made whereby he will be placed on the list to receive the forecasts, weather map, or other publications desired. The proper form of address for such communications is: "Local Office, U. S. Weather Bureau" (followed by the post-office of the section center).[a]

NATURE OF THE SPECIAL WARNINGS.

Special warnings are amplifications of the general forecasts which bring to public notice the advent of special weather conditions that may endanger agricultural interests, affect the work of transportation companies, or destroy vessels at sea. The special rainfall warnings, the frost warnings, and even the cold-wave warnings are exclusively or very largely beneficial to the agriculturist, and it is especially with reference to those crops most likely to be injured by rain or cold that protective measures have been devised.

USE OF SPECIAL RAINFALL WARNINGS.

The special rainfall warnings in the interest of the raisin and prune drying industries of California may be cited as the best example of the benefits derived from the work of the Weather Bureau. California supplies nearly the entire demand of the United States for raisins. In nearly all the interior valleys during August, September, and October the conditions are ideal for drying the fruit in the open, owing to the clearness of the sky and the dryness of the atmosphere, but occasionally sudden rains come up which may do great damage to the drying fruit. The local conditions in the fruit-drying regions are such, however, that the infrequent late summer and autumn rains can be predicted with a high degree of accuracy. Through the cooperation of the railroads and the telegraph companies, the special rain warnings receive very wide distribution, so that every drier in the affected region will receive them in ample time to

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[a] In order to facilitate such requests a list of all the section centers is given herewith:

Alabama, Montgomery.
Arkansas, Little Rock.
Arizona, Phoenix.
California, San Francisco.
Colorado, Denver.
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, } Boston, Mass.
Delaware, Maryland, } Baltimore, Md.
District of Columbia, Washington.
Florida, Jacksonville.
Georgia, Atlanta.
Hawaii, Honolulu.
Idaho, Boise.
Illinois, Springfield.
Indiana, Indianapolis.
Iowa, Des Moines.
Kansas, Topeka.
Kentucky, Louisville.
Louisiana, New Orleans.
Michigan, Grand Rapids.
Minnesota, Minneapolis.
Mississippi, Vicksburg.
Missouri, Columbia.
Montana, Helena.
Nebraska, Lincoln.
Nevada, Reno.
New Mexico, Santa Fe.
New York, Ithaca.
North Carolina, Raleigh.
North Dakota, Bismarck.
Ohio, Columbus.
Oklahoma, Oklahoma City.
Oregon, Portland.
Pennsylvania, Philadelphia.
Porto Rico, San Juan.
South Carolina, Columbia.
South Dakota, Huron.
Tennessee, Nashville.
Texas, Houston.
Utah, Salt Lake City.
Virginia, Richmond.
Washington, Seattle.
West Virginia, Parkersburg.
Wisconsin, Milwaukee.
Wyoming, Cheyenne.

save his crop. In regard to the method employed to protect the fruit, Professor McAdie says:

> Beginning with the fall of the year fruit is spread upon trays for sun drying and curing. At the present time (September) in nearly all the valleys of California large quantities of Muscat grapes are spread upon trays of paper or wood and exposed to the sun. If these should be rained upon they would become wet, dirty, and sticky, and instead of making high-grade raisins might be fit only for wine vats. Speaking generally, if caught by rain, raisins would lose about two-thirds of their value. When the Weather Bureau forecasts showers, laborers go at once into the vineyards and stack the trays one above another. The system has so developed that labor unions charge at the rate of 75 cents a day if the Weather Bureau says "showers;" otherwise the rate is 50 cents.

These warnings are issued from the San Francisco office, and a failure of the forecast is so rare that no owner of a vineyard can afford to be without them.

Irrigation is practiced to some extent in the humid States of the East, especially in New England, the Middle States, and Florida. The chief crops irrigated are garden produce, tobacco, oranges, and pineapples. Often a farmer may be about to irrigate his crops after a prolonged period of dry weather, but will be saved the labor and expense by observing that rain has been predicted.

In the extreme western States the forecasts of cold rains or snow are valuable to woolgrowers, enabling them to protect sheep at lambing time and when shearing is under way.

USE OF FROST AND COLD-WAVE WARNINGS.

The lack of climatic statistics regarding severe winters in Florida led to the extension of orange culture above the normal northern limit, and when several severe freezes occurred the failure to apply protective methods since shown to be capable of greatly reducing the damage resulted in the diminution of the yield of oranges in Florida from 6,000,000 boxes in 1894 to 75,000 in the year following. Since then methods of protection have been carefully studied and applied. The immensely valuable citrus-fruit interests of California also need protection.

On the other hand, special industries have been developed in which great financial gain results from extending the growing period of crops beyond the normal limit. In these industries success frequently depends on the application of protective measures to prevent injury by cold or storms. Early strawberries and truck crops in the States bordering the South Atlantic and Gulf coasts are examples, the profits depending largely on rushing the crops to northern markets as early as possible. Methods of protecting deciduous fruits also are now extensively employed in many States.

There are many other crops that need occasional protection, such as sugar cane in Texas and Louisiana, cranberries in Wisconsin

and Massachusetts, and tobacco in many States. Frosts, however, can be successfully predicted, and protective methods are practicable. In a community engaged largely in growing one crop, as grapes, orchard fruits, or oranges, cooperation in the use of protective measures should be arranged. The Weather Bureau will furnish the warnings, and if requested will give expert advice as to the best method to be used in special cases.

The Weather Bureau has published from time to time important papers on the subject of preventing damage by frost, among which may be mentioned a pamphlet by Hammon, a rather complete résumé of the subject by Professor Garriott in Farmers' Bulletin 104, and a bulletin on frost fighting by Professor McAdie, of the San Francisco office.[a] These bulletins should be carefully studied, as they give the scientific principles of frost formation and describe in considerable detail the practical methods of preventing loss. The frost warnings will usually specify whether a light frost or a killing frost is probable, and the cold-wave warnings will indicate the lowest temperature expected.

A good deal of self-help is possible in determining whether frost will actually occur. The formation of the land, by controlling local air currents, often brings about the formation of frost in certain portions of a farm while the neighboring slopes are exempt. The owner of an orchard should study thoroughly the "lay" of his land and find where the "cold spots" are located and where the danger will be greatest. The possession of a reliable psychrometer is essential. This consists of two thermometers[b] fastened to a board and attached to a stout cord, by means of which they can be whirled in the air. One thermometer has its bulb covered with a thin piece of muslin. Before an observation the muslin is wet with water. On whirling the thermometers until there is no further change in the readings, it will be found that usually the wet-bulb thermometer shows a lower temperature than the dry-bulb. From the difference between the two readings, by the aid of suitable tables, the dew-point can readily be ascertained.[c] Under certain conditions the determination of the dew-point will give valuable information as to the probability of frost. A simple thermometer will also be useful to find the coldest portions of the orchard, and to measure the rise in tempera-

[a] Frost: When to Expect It and How to Lessen the Injury Therefrom, Weather Bureau Bulletin 23, 1899; Notes on Frost, by E. B. Garriott, Farmers' Bulletin 104; Frost Fighting, by Alexander G. McAdie, Weather Bureau Bulletin 29, 1900.

[b] Standard thermometers are costly, but cheap ones will serve very well if tested for accuracy. This will be done free at any Weather Bureau office.

[c] These tables will be found in Weather Bureau Bulletin 23; also in a paper on Instruments for Making Weather Observations on the Farm in the Yearbook for 1908 (reprinted as Yearbook Extract 492).

ture caused by firing, smudges, etc., thus giving a standard of the effectiveness of the methods of protection tried.

Different methods of protection will be required according as one has to do with frosts or with freezing temperatures. Both are caused by movements of areas of high atmospheric pressure that bring masses of cold air over a region. In the case of frost the lowest temperature is attained after the wind has died down, and results from outward radiation of heat from the ground or from the surface of vegetation through the clear atmosphere into space. In order that frost be formed, the dew-point near the ground must be below 32°, when the deposited water at once takes the form of ice. If the air be very dry, the temperature may fall low enough to injure vegetation without the formation of frost; i. e., by what is known as a "black frost." If the air be very moist, the condensation of vapor as dew may begin before the temperature of 32° is reached, and the latent heat liberated by the condensed water will frequently prevent the formation of frost. Hence the value of ascertaining whether the dew-point is above or below 32°; if above, as a general rule frost need not be feared, unless the wind is still bringing colder air from neighboring regions. Thus the conditions favorable for frost formation are (1) clear skies, with little wind movement; (2) a certain (but not excessive) amount of moisture in the air; and (3) high atmospheric pressure.

Since cold air is heavier than warm air, during frosty nights the cold air will flow down the slopes to low places, rendering frost more likely to occur at such points or in streaks along the ground. This is what Professor McAdie refers to when he states that "the formation of frost is primarily a matter of air drainage." So much is this the case that in hilly or mountainous countries frostless belts are formed, of which a description will be found in Farmers' Bulletin 104. Therefore truck crops and orchards should not be placed on low ground, but better on hillsides, in order to secure a circulation of air. It is evident that windbreaks will not be beneficial against frost formed in this way, but rather, by creating regions of quiet atmosphere, may be detrimental.

When, however, the wind continues to blow during the night and the cold is caused not so much by loss of heat through nocturnal radiation as by the actual movement of cold air from distant regions—the so-called "cold wave"—more effective methods of protection must be adopted. Windbreaks properly placed on the west or northwest side of the orchard will be useful. It has also been found beneficial to plant groves in the vicinity of lakes on account of the ameliorating effect of the water. The citrus-fruit growers of Florida have had to contend against very severe freezes, such as are entirely unknown to their brothers in California, who have had to deal mostly with the milder forms of frost.

METHODS OF PROTECTING SPECIAL CROPS.

EARLY STRAWBERRIES AND TRUCK CROPS.—In the eastern States many growers of early strawberries for northern markets keep pine straw between the rows of berries, to act as a moisture-retaining mulch, to keep the berries clean, and to serve as a convenient material for protective purposes when frost threatens. The covering of the berries is very expeditiously performed at very small cost by simply running a plow between the rows, thus throwing the pine needles over the plants to a depth of from 4 to 6 inches. When danger is over the material is easily raked back between the rows. In Texas, Louisiana, and other States prairie hay is used for the same purpose. Smudging or firing by some of the methods mentioned below has also proved successful. Both bloom and fruit already formed are saved by these means from all except the severest freezes.

The same methods are used to save all kinds of truck crops, such as peas, beans, cucumbers, cabbages, potatoes, etc. Sometimes when the cold wave is expected to be severe and the plants are quite young soil is thrown over them by plowing a furrow near the rows and allowing the dirt to bury them; or if the soil be wet a spade may be used to make a protecting mound about each plant. Cabbage plants have been saved by placing a handful or two of hay on the northwest side. Screens made of cheap cloth stretched over wooden frames are very useful and quite effective against moderate cold.

Hotbeds will usually stand ordinary freezes, but during severe cold waves need an extra covering of blankets or other warm material In the South cold frames are used for early vegetables and may be left open during warm days in February, March, or April. When frost is predicted the cold frames are closed. As profits depend on having the crops attain maturity as early as possible, those who utilize the forecasts and protect their plants may be able to set them out in the fields at the time when others who failed to heed the warnings are just resowing their seeds.

GARDENS AND FLOWER BEDS.—Small gardens and flower beds may be protected by coverings of paper, cheap cloth, or other light material stretched on frames, or stakes may be driven on each side of the beds to support a cloth covering. Old straw matting is excellent for the purpose. Single plants may be protected by boxes or barrels lined with paper, or by conical caps of pasteboard, etc. To florists the cold-wave warnings are extremely important; tender plants are removed to greenhouses, arrangements are made for increasing the heat in the houses, and many other precautions are taken to prevent loss. Nurserymen protect stock and hold back the shipment of trees.

TOBACCO.—In spring tobacco growers protect plants in beds by canvas or cloth covered frames. In fall late tobacco is often likely to suffer serious injury by frost, but generally the plants are so near maturity that on receipt of warnings they may be rapidly cut and housed.

SUGAR CANE.—In fall it is important to allow sugar cane to remain standing in the fields as long as possible, since this increases the yield of sugar. There is a saving also in cutting only as fast as the cane can be ground. Doctor Cline, of the New Orleans office, states that sugar cane when well matured will stand in dry weather a temperature of 30°, and even as low as 28°, if it continues only a short time; when rain or sleet accompanies the fall in temperature cane will stand 26° without much injury. A change of a few degrees when near the freezing point is important; therefore frost warnings for the benefit of the Texas and Louisiana sugar interests specify the minimum temperature expected. When warnings are received the cane is cut close to the ground and windrowed—that is, piled in a ridge, so that only the cane on top suffers, or it is laid on the ground in successive rows, so that the leaves of one row will cover and shelter the butts of the preceding row. In this condition the canes are safe from frost and will keep for several weeks.

CRANBERRIES.—This crop is grown only in low swamp or bog lands in Massachusetts, New Jersey, Wisconsin, and other limited areas. The lands are always low, collect the cold air from neighboring slopes, and are thus particularly liable to frosts, which may destroy from 10 to 50 per cent of the crop. The growth of the vines requires that they be flooded at certain seasons of the year, and this affords also a convenient way to protect them from frost. When frost warnings are issued the marshes are at once flooded with water from the reservoirs, the plants being only partially submerged. The protection is due partly to the warmth of the water (especially in autumn) and the longer time it takes to cool (high specific heat), and partly to the moisture added to the air. The temperature in the flooded fields may fall as low as 25° without much danger.

METHODS OF PROTECTING CITRUS AND DECIDUOUS FRUITS.

Since the two great freezes of 1894-95 and February, 1899, which killed or seriously damaged nearly 90 per cent of the orange trees in Florida, methods of protection have been applied on a very extensive scale in that State. Orange trees need protection during December, January, and February. Temperatures a few degrees below freezing, if long continued, will ruin the bloom and setting fruit, but much lower temperatures are necessary to kill the trees. The deciduous fruits, such as apples, apricots, peaches, pears, plums, etc., need protection chiefly from killing frosts in spring after the trees have bloomed; the buds or setting fruit can be injured by temperatures a few degrees below freezing (Hammon says 27° to 30°). An automatic device is often used to give warning by the ringing of a bell when the temperature has fallen to the danger point. The methods of protection that have been devised are very numerous, and the proper one to apply depends largely on the topography and surroundings of the orchard.

HILLING OR BANKING.—When it is a question of saving orange trees from severe cold such as might kill the entire tree, especially when high winds render other methods futile, the only safe procedure is to bank up the trees with dirt or sand. During the freeze of February, 1899, in a large orange orchard near Diamond, La., 4,000 trees were saved by this means. Sand or dirt banks are necessary to save orange trees whenever the temperature is expected to fall as low as 20°, even if firing is also used. A convenient way to accomplish the work rapidly is to have ready in the fall mounds of earth about each tree but not touching the trunks. It requires only a short time to fill the funnels with earth. Or 4-foot laths can be closely woven on three or four strands of telephone wire and used to curb the trees. A small quantity of soil will fill the curbs. The expense of banking trees to a height of 3 or 4 feet and taking down the banks in spring should not exceed 10 cents per tree. The method will save the most important part of the tree, although the leafy portion may be entirely killed.

FIRING.—This is the process of directly heating the air, and when well managed is very effective. Firing is probably of little use when the wind is high or when the temperature falls below 20°, but in quiet air it is unquestionably one of the best methods than can be used to raise the temperature of a grove and prevent damage by cold. Considerable skill is required to properly manage the fires. The most serious mistake is to endeavor to produce intense heat by having very hot fires, because a strong draft is created which carries the heat directly into the upper atmosphere, where it is of no value, and fuel, time, and labor are wasted. The practicability of this method depends on the fact that at night there is an inversion of temperature, the air being coldest near the ground and gradually becoming warmer upward; hence the

lower air may be warmed to a considerable extent before an upward draft will be created. The best results are obtained by means of very numerous but small, slowly burning, and well-distributed fires of coal, wood, or whatever fuel is cheapest in the locality. In Florida wood is used because it is abundant; the pieces are large to save expense of cutting, and the piles are placed ready in the fall in the midst of every four trees, or one fire in each square equidistant from the trees. In California the best results are obtained by means of coal placed in wire baskets hung a short distance above the ground. From 20 to 50 baskets to the acre are used. Crude oils have been tried and make a hot fire, but have the disadvantage of forming much lampblack, which sticks to the leaves and fruit. In Georgia coal tar is used in peach orchards, as the smoke is said to prevent the ravages of the curculio. In Colorado patent smudge-producing fire pots are employed. Firing properly managed will raise the temperature of the air in a grove of orange trees above freezing if the outside temperature be not lower than possibly 25°. In some instances in Florida, with an outside temperature of 20°, firing caused a rise in the groves to 27° or even 30°.

Sheds, screens, and tents.—Owing to the greater need of protection from severe cold in Florida many growers built sheds over their groves or used lath screens and tents on a very large scale. The sides of the sheds were usually built close, and the covering above the trees consisted either of movable planks or cypress veneer 4 inches wide, woven together with wire and having 4 inches of space between the slats, or of ordinary building laths similarly woven with spaces the width of a lath. These coverings remained the year round, the partial shade from the hot sun having been found beneficial to the trees. Some of these lath roofs were also covered with cheap cloth, which was removed after danger from frost had passed. In other forms the shed coverings consisted of hanging panels, which were closed on receipt of warnings. The interior of the shed was warmed by small fires or simple sheet-iron stoves. In closed sheds of this kind the temperature inside may be kept from 10° to 20° higher than it is outside. The cost of these elaborate forms of sheds varies from $400 to $700 per acre and is prohibitive, except where the crop has very high value and the market is close by.

The efforts to secure cheaper but still effective covering led to the devising of many kinds of tents made of canvas or some cheap cloth treated with paraffin or other substance to make it impervious to moisture and more durable. Tents as a rule are placed over single trees and the air within is warmed by means of small kerosene lamps holding sufficient oil to burn all night. Perhaps the simplest form of tent is circular in shape, with perpendicular sides and a cone-shaped top, the size depending on the height of the tree to be covered. One seam is left open so that the tent may readily be slipped around the tree. On the approach of cold weather the tents are rapidly placed around the trees, being supported by the branches or by a single upright post at one side of each tree. They are removed as soon as danger is past in order to avoid stimulating early growth of the trees.

Smudge fires, damp smudges, etc.—A smudge of dense smoke acts as a protection from frost because it diminishes nocturnal radiation just as clouds do. Fuel should be used that makes a very thick smoke. The fires should be placed on the windward side of the orchard or grove and should be started early in the evening, for if radiation is permitted to go on during the early part of the night it can not afterwards be checked by smoke. The method is economical and well adapted for use in vineyards, gardens, orchards, and orange groves when the night is not windy and the temperature is not expected to fall much below 27 degrees. No form of dry fuel will make a smoke thick or dense enough for the required purpose; hence the fuel must be wet with water or the heat of dry fuel must be made to pass through some moist material, such as wet straw. Manure with a little oil poured on it makes a good smudge fire, or mixtures of tar or oil with any combustible material, such as damp straw, bales of hay, prunings,

pine branches, coal, or sawdust, etc. The use of moist fuel has several advantages. The water is evaporated and the vapor added to the air, the subsequent condensation of which as it moves away from the fire to cooler portions of the orchard will liberate much latent heat; the fires burn more slowly, and the smoke becomes heavy and thick because of the visible fog or mist formed by the condensed vapor.

A very effective way to obtain a dense smoke is to fasten at the corners a piece of wire screen 4 feet square to 4 stakes set in the ground. A quantity of coarse manure is placed on the screen and beneath it a can of crude petroleum or a pot of tar, which is set on fire. A dense white smoke results which will soon fill the orchard and be retained among the branches of the trees.

Portable smudge fires are advantageous, since they may be moved where needed and permit the use of stronger fires to evaporate the water from the wet fuel. The smoke and heat trail off behind and, there being no strong upward draft, the heat is well distributed. As typical of many devices that have proved successful the plan adopted by a fruit company of Visalia, Cal., may be mentioned. Wire frames are built on low truck wagons, stretching from the four wagon stakes, and are heaped over with wet manure or straw. Dirt is then thrown on the wagon bed to protect it, and pots of burning tar are set underneath the straw roof. A barrel of water on the wagon is used to keep the manure wet. These wagons are driven about and the smoke and vapor, carried to the rear, falls close to the ground in a long white trail. With this device the fruit company referred to in one night covered 400 acres of orchard with a white fog from the ground to a height of about 20 feet. Another company at Biggs, Cal., successfully protected an orchard of 300 acres by similar means during six successive nights of severe frost in April, 1896.

IRRIGATION AND SPRAYING.—Irrigation is another important method of protection from frost which has often been very successfully applied, especially in the Eastern and Southern States, where the supply of water is abundant and the atmosphere naturally contains much moisture. There is also much evidence in its favor even in the arid regions of California. Water is drawn from the rivers or from reservoirs by suitable ditches or by pumps and is led to irrigation furrows between the rows of trees. Professor McAdie, in his pamphlet on frost fighting, describes an experiment at Riverside, Cal., in which warm water was used, combining the good effects of irrigation and of heating. It seems, however, that this method if used early in the season would start early growth, making the trees more susceptible to injury by frost later on. It is well known that the condition of a tree has much to do with its liability to injury by cold; fresh growth is easily damaged, while vegetation in a dormant condition is comparatively safe. Hence it is best early in the season to use cold water for irrigating purposes in order to retard the development of the trees. Professor Hammon, in Bulletin 23, gives an interesting example of the value of irrigation as described by Mr. I. H. Thomas, of Visalia, to the California State Board of Trade: The temperature of the orchard fell to 28° F. and wherever the water was run the effect of the frost was neutralized and the fruit was saved. At one spot on the 40 acres that was flooded there was a piece of raised ground that contained about 20 to 30 trees which the water did not reach. The fruit on the trees in this spot was frozen, while on the flooded portion there was no damage.

Spraying is chiefly beneficial to mitigate the effects of frost on plants before the injury has had time to appear. When living plants are subjected to freezing temperatures the protoplasm of the cells contracts, and the water contained in it exudes into the intercellular spaces, where it freezes, but the cell walls are not broken. Now, if plants thus touched by frost are sprayed with cold water before sunrise, the rise in the temperature is gradual and the plants thaw out slowly enough to enable the protoplasm to reabsorb the water, thus lessening the injury.

PROTECTION OF FOOD PRODUCTS DURING TRANSPORTATION.

The storm and cold-wave warnings are of the greatest value to transportation companies when engaged in the shipment of perishable products, whether by rail across the continent or by boats on the Great Lakes or the ocean highways. Whole train loads of perishable fruits have been sheltered in roundhouses on the receipt of warning of severe cold waves; the heating, ventilating, and re-icing of refrigerator cars are controlled by the weather forecasts; precautions against loss are taken in a hundred different ways. At first sight this may seem of no special benefit to agricultural interests, yet indirectly it is of importance, since ultimately the producer and consumer must pay for all losses that occur during shipment.[a] The railroads also use climatic data very largely in the settlement of claims, many of which are brought by shippers who themselves are farmers.

PROTECTION OF CATTLE AND OTHER LIVE STOCK DURING SEVERE COLD WAVES.

The severity of cold waves in the region of the Great Plains in the Northwest makes it imperative that the owner of a small herd should keep himself informed of weather conditions. As a rule the warnings are now heeded and the loss by freezing has been reduced to a minimum. Herds are gathered together at short notice and driven to the home ranch for care and food. Sheep are always accompanied by a shepherd, and when a cold-wave warning is received the sheep are either housed or driven to the northwestward of their shelter, so that when the storm comes the herd will drift home with the wind. Larger herds of beef cattle are simply driven into sheltered valleys or canyons, where they receive some measure of protection.

USE OF STORM WARNINGS.

The storm warnings for the benefit of marine interests are sometimes beneficial to farmers dwelling near the coasts, but no specific directions how to utilize them can be given. In the cotton belt the announcement of the approach of a West India hurricane, which is almost always accompanied by driving rain and high winds, is beneficial when there is much open cotton in the fields. Frequently farmers have employed all their hands to pick the cotton before the storm arrived and saved it from being blown out of the bolls and soiled by the rain and mud.

[a] Weather Bureau Bulletin 13, Temperatures Injurious to Food Products in Storage and During Transportation, by H. E. Williams, 1894.

USE OF FLOOD WARNINGS.

On every important river in the United States the Weather Bureau maintains a system of river and rainfall stations which telegraph to the river forecast centers the data necessary to predetermine the movements of floods. The flood warnings of the Bureau have reached a wonderful degree of accuracy, the highest river stages attained in the largest rivers rarely varying more than a few tenths of a foot from the stages predicted. The warnings are issued so far in advance of the arrival of the crest of the flood that agricultural and other interests derive immense benefit from them. On receipt of flood warnings every effort is made by transportation companies, both railroad and steamship lines, to safeguard property; merchandise of all kinds is moved to places of safety; levees are raised or strengthened; people living on low lands or islands are warned in time to save their household goods, agricultural implements, and farm animals.

Planters on receipt of warnings of early spring freshets delay planting on low ground until danger is past, thus saving the cost of seed and labor. At other seasons of the year crops nearly ready for harvest may be rapidly cut, or those already harvested but remaining in the fields may be removed from the danger zone.

The low alluvial lands near the river bottoms and many low islands in the streams possess a very rich soil covered with a thick growth of grass, making them favorite grazing places for live stock; but since they are subject to frequent overflows the loss to the farmer might be very considerable if he had no warning of coming floods. In some cases the flood waters first flow along the bluffs away from the river and soon cut off access to the mainland. Accordingly, when flood warnings are issued the first efforts of the farmer are directed to saving his cattle, horses, and mules by removing them from islands and low ground and driving them to higher places in the vicinity. In some cases artificial mounds have been built for the purpose which can be utilized with very high river stages. Cattle are often removed to the higher lands by boats.

As another example, it may be mentioned that much cotton is grown on rich low ground between the river and the levees on the lower course of the Mississippi River. When a flood comes at a time when the cotton is open, the crop is often saved by rushing the work of picking, while cotton gins run night and day. The baled cotton is then shipped at once to the factories or it is stored. In Vicksburg, Miss., during the flood of February, 1907, 12,000 bales of cotton endangered by the rising water were placed in vacant lots and along the sides of the streets throughout the city.

INJURIES TO FOREST TREES BY FLAT-HEADED BORERS.

By H. E. Burke,

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INTRODUCTION.

It has been estimated by good authority[a] that injury to forest trees by insects causes the people of the United States an annual loss of $100,000,000. This enormous loss is caused by many groups of insects, among which a few stand out as particularly destructive. One of these is composed of the so-called flat-headed bark and wood borers, or grubs, which are immature stages of a family of beetles technically known as Buprestidæ.

FLAT-HEADED BORERS.

Flat-headed borers are called so because of the greatly enlarged and flattened first, or prothoracic, segment, which gives them their characteristic appearance. This segment almost completely engulfs the true head and is usually taken for it, hence the name flat-headed or hammer-headed. All flat-headed borers are miners in the tissues of living, dying, or dead plants. Some mine the leaves, some the bark, some the sapwood, and some the heartwood of trees. Others live in herbaceous plants. Each starts as an egg laid on the host plant by a female beetle, hatches into a larva or borer, feeds on the plant tissues and grows to full size, changes into a resting stage or pupa, and then transforms to a beetle. The larval, or borer, stage, usually met with in dying trees, is the destructive one and therefore the most important from an economic standpoint.

Economic Importance.

Flat-headed borers injurious to forest trees are of two principal classes—those which destroy the vital part of the tree, the bark, and cause its death, and those which damage or destroy its principal product, the timber.

The bark borers have, at one time and another, caused the death of a large number of trees in the forests of the United States. The dying

[a] See "Catalogue Exhibits of Insect Enemies of Forests and Forest Products," etc., Bul. 48, Bur. Ent., U. S. Dept. Agr., 1904.

chestnut of the Appalachian region and the birches of the Northern and Eastern States are evidences of the fact that they are still actively at their pernicious work.

The wood borers, such as the destructive wood borers of the cypress, western red cedar, and pine, are probably of even greater economic importance than the bark borers, for they mine the sapwood and heartwood of many living, dying, and dead trees, and either ruin it completely or damage it so that it can not be used for the higher grade products.

Character of Work.

The borer work or injury consists of a flattened, oval, gradually enlarging, more or less tortuously winding mine or wormhole, which, when completed, widens out into an elongate-oval pupal cell. This cell connects with the outer surface by a short, oval exit hole. The mine has its surface marked by fine, transverse, crescentic lines and is usually tightly packed with sawdust-like borings and pellets of woody excrement. The pupal cell and exit hole are usually empty, except when occupied by the insect. The injury may be entirely in the bark, entirely in the wood, or, as is usually the case, in both bark and wood.

Life History.

In general the life history is as follows: The female lays an egg in a crevice in the bark or under the bark at the edge of a wound. The egg soon hatches into a borer or larva, which mines the inner bark or wood until it reaches maturity. It then forms a pupal cell in the bark or wood, in which it pupates and transforms to the adult. The adult excavates an exit hole from the pupal cell to the outer surface and emerges. After emergence it usually feeds on the foliage of some plant, sometimes that of the host plant, but often that of some other, before it becomes sexually mature and mates. If it is a female, it then completes the life cycle by egg laying, thus starting a new generation. Mating and egg laying over, the life work is completed and death soon follows.

Seasonal History.

The egg is laid in the spring or summer and the borer hatching from it feeds until the following fall, or the second fall, before it reaches maturity. It then either rests over the winter in the larval stage and pupates and transforms to the adult the following spring; or it pupates in the fall, rests over the winter in the pupal stage, and transforms to the adult in the spring; or it pupates and transforms to the adult in the fall and rests over the winter in the adult stage. In practically all cases it emerges in the spring or summer following

the pupation and the transformation to the adult. Feeding begins soon after emergence; and mating, egg laying, and death soon follow, the whole being completed before the end of summer.

INJURIES BY FLAT-HEADED BARK-BORERS.

The flat-headed bark-borers kill the trees by boring through the vital layer of inner bark and outer wood until their winding mines completely encircle the trunk. This girdles the tree and causes its death by stopping the circulation of the sap. They also injure the timber by causing serious "gum spot" defects to form in the wood of trees that recover from their attacks. These defects are the healed-over borer mines.

THE TWO-LINED CHESTNUT BORER.

(*Agrilus bilineatus* Weber.)

During the past twenty years many of the finest chestnut trees in the eastern United States have died. The trouble has been particularly bad throughout the Eastern Appalachians, especially in Maryland, Virginia, and North Carolina. It has also been reported from the District of Columbia, Georgia, West Virginia, Illinois, Wisconsin, and Michigan.

One cause of the trouble is an injury (fig. 25) made by a worm or grub which excavates a winding mine 6 to 10 inches long in the inner bark and outer wood of the main trunk and larger branches. This mine winds tortuously back and forth and up and down through the bark and outer wood until, with a number of similar mines, it completely girdles the tree and causes its death.

The grub (fig. 25) is slender, flattened, and milk-white or yellowish-white in color. It has a broad, flattened, head-like prothorax, marked on both upper and lower surfaces by a single, median, brown line. The head has dark-brown mouthparts and the opposite end of the body is armed with a dark-brown, pincer-like tail fork. It is about 22 mm.[a] long and 3 mm. broad. It lives in the bark about a year, changing in the spring or early summer into an elongate, subcylindrical, two-striped, dull black or brownish-black beetle (fig. 25). The beetle varies from 6 to 10 mm. in length and from 2 to 3 mm. in breadth. The stripes, which are golden yellow in color, mark the sides of the pronotum and form a submedian longitudinal line on each wing cover. Sometimes they are quite faint, especially on the wing covers. The beetle emerges in May or June, mates, and goes to a weakened or a healthy tree to deposit its eggs and spread the destruction.

The methods of controlling the ravages of this insect are strictly preventive. Practically nothing can be done to save trees that are

[a] 1 mm. = $\frac{1}{25}$ inch.

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once attacked, for the damage is nearly always completed before there are any outward indications of injury. All of the energies should be directed toward preserving the trees that are still healthy and uninjured. As the trees that are dead, dying, or weakened from disease, insect attack, fire, storm, or any other cause usually furnish the proper conditions for the development of large broods of the destructive

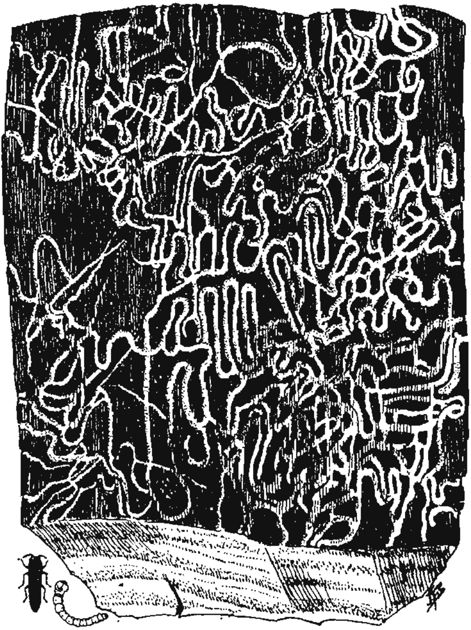

FIG. 25.—Work of the two-lined chestnut borer (*Agrilus bilineatus* Weber: Section of wood of the main trunk of a dead chestnut, showing larval mines on the outer surface. Three-fifths natural size. Adult, natural size; larva, three-fifths natural size. (Original.)

insects, which emerge and attack the living trees, all such trees should be felled as soon as noticed, or at least before the 1st of May, and the bark, including that of the stumps and branches, removed and burned. The wood may be used for lumber or fuel.

Any felled or sawn chestnut timber or cord wood, with the bark on, lying in the immediate neighborhood and found to be infested, should be treated likewise. This will kill the broods and prevent a successful

attack on the remaining healthy trees. The oak and beech are also attacked by this insect and should be watched along with the chestnut. In fact, in some localities the pest is as active an enemy of the oak as it is of the chestnut.[a]

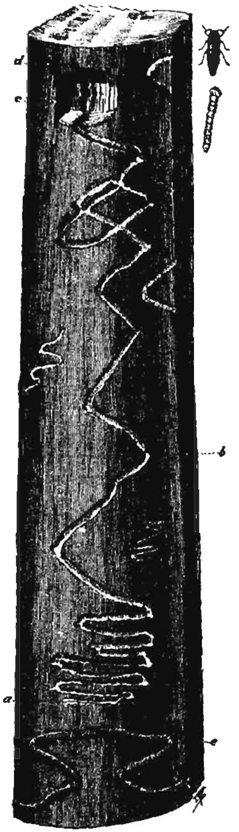

FIG. 26.—Work of the bronze birch borer (*Agrilus anxius* Gory). Section of wood of main trunk of dying aspen, showing: *a*, Commencement of the larval mine in the outer surface; *b*, main portion of larval mine; *c*, pupal cell in wood; *d*, adult exit hole; *e*, old larval mine healed over by new growth. One-third natural size. Adult, natural size; larva, one-half natural size. (Original.)

THE BRONZE BIRCH BORER.

(*Agrilus anxius* Gory.)

Birches, poplars, cottonwoods, balm-of-gileads, and aspens in many parts of the United States are dying from injury caused by an insect (fig. 26) which is quite similar to that which is killing the chestnut in the Eastern States. This is particularly bad among the imported birches in the parks of cities in the Northern and Eastern States, but it also does considerable damage to the aspen, cottonwood, and western birch in the Rocky Mountain States.

As with the chestnut trouble, the borer responsible for this damage is a creamy white grub or larva (fig. 26) which mines the inner bark and outer wood of the tree until the circulation is cut off and death results. The species is a near relative of the chestnut borer and the larva resembles it very closely. It sometimes grows a little larger, reaching a length of 28 mm. It changes to a slender, olive-bronze beetle (fig. 26), 7 to 10 mm. long, which emerges in May or June.

The method of control is the same as that recommended for the chestnut borer.[b]

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[a] See "The Two-Lined Chestnut Borer," Cir. 24, Bur. Ent.; "Insect Injuries to Hardwood Forest Trees," Yearbook, 1903, p. 313.

[b] See "A Destructive Borer Enemy of Birch Trees," Bul. 18, Bur. Ent.; "Insect Injuries to Hardwood Forest Trees," Yearbook, 1903, p. 318.

THE FLAT-HEADED WESTERN HEMLOCK BARK-BORER.

(*Melanophila drummondi* Kirby.)

Healthy, injured, dying, and dead larch, fir, spruce, hemlock, Douglas fir, and pine in the Rocky Mountain and Pacific States are often attacked by a flat-headed borer which excavates shallow winding mines (fig. 27) 6 to 12 inches long by one-fourth to one-half inch wide, through the inner layers of the bark of the main trunk. Many trees are killed or seriously weakened by this attack and many others

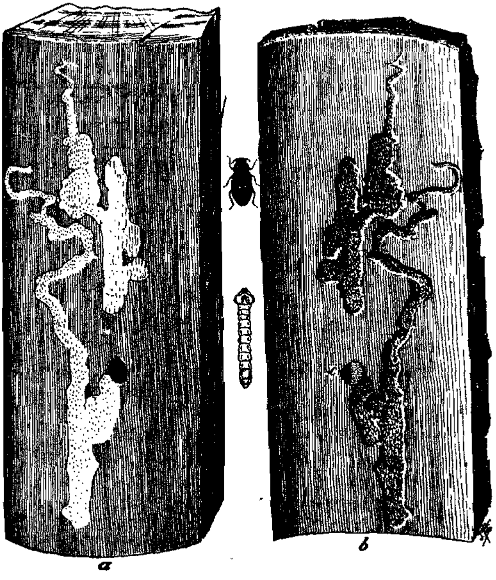

FIG. 27.—Work of the flat-headed western hemlock bark-borer (*Melanophila drummondi* Kirby): *a*, Section of hemlock wood showing larval mines on outer surface; *b*, section of hemlock bark showing same mines in inner surface; *c*, entrance to pupal cell in bark. *One-half natural size. Adult, four-fifths natural size*; larva, natural size. (Original.)

have serious "gum-spot" defects formed in the wood when the wounds caused by the mines heal over.

The borer (fig. 27) or larva differs to some extent from the chestnut borer and the birch borer. It has the same broad, flat, head-like thorax, but it is not so slender and the tail fork is missing. Then,

too, the dorsal surface of the thorax is marked by a narrow inverted V instead of the single median line. The mine in the inner bark is shorter, broader, and less winding. The full-grown borer is about 23 mm. long and 5 mm. wide. It passes the winter in the bark or outer wood and changes in the spring into a beetle (fig. 27), which emerges from the bark during the spring or early summer. The beetle is from 7 to 12 mm. long and 3 to 5 mm. broad. It is rather broad, brown or blackish-bronze in color, and usually has three short ridges and three yellow spots on each wing cover.

The methods of control are practically the same as with the chestnut borer. If the forest is kept free from injured, dying, dead, and felled trees there will be no breeding spots and therefore no increase or serious attacks of the destructive insects. Dying trees found to be infested with this borer should be cut between October 1 and April 1 of the year following and the bark should be removed and burned. If losses are caused by the "gum-spot" defects or injuries in the wood they can be lessened or prevented by using the injured timber for construction or other purposes where the injury is not detrimental.[a]

FIG. 28.—Work of the flat-headed eastern hemlock bark-borer (*Melanophila fulvoguttata* Harr.): Section of hemlock bark showing larval mines in the inner portion. One-half natural size. Adult, larva, natural size. (Original.)

THE FLAT-HEADED EASTERN HEMLOCK BARK-BORER.

(*Melanophila fulvoguttata* Harr.)

This species, which is a close relative of the western hemlock bark-borer, has caused the death of a large amount of hemlock timber

[a] See "Preliminary Report on the Insect Enemies of Forests in the Northwest," Bul. 21, Bur. Ent.; "On the Study of Forest Entomology in America," Bul. 37, Bur. Ent.

throughout the Appalachian and Northeastern States. It mines the bark on living, injured, and dying trees (fig. 28) and kills them outright or hastens their death. Both the larva and adult (fig. 28) closely resemble the larva and adult of the western species. The larvæ have no recognizable differences, but the adult of the eastern species is without the ridges on the wing covers. The habits are about the same and the methods of control the same.[a]

INJURIES BY FLAT-HEADED WOOD-BORERS.

The flat-headed wood-borers injure or destroy the timber by mining the sapwood and heartwood of living, dying, and dead trees until it is riddled with flattened, oval wormholes and is unfit for the higher grade uses.

THE FLAT-HEADED BALD CYPRESS SAPWOOD BORER.

(*Acmæodera pulchella* Hbst.)

Dying and dead bald cypresses in the Southern States often have their sapwood riddled by flattened, oval, winding mines (fig. 29), which are usually filled with small pellet-like borings and have their surface marked by fine, wavy ridges. The trouble is worse in trees that have been girdled or deadened several years and in those that have been felled some time. As the common practice of the lumbermen in the southern forests is to "deaden" their trees for a year or so before logging, this borer probably causes them considerable loss.

The borer or larva (fig. 29) is milk-white in color and about 13 mm. long by 4 mm. broad at the widest part. The first segment is broader than the others and rather short. It is marked on both surfaces by a brownish median groove or line. There is no tail fork. The change to adult is made in the wood in the spring and the emergence takes place in early summer. The adult (fig. 29) is a blackish or blue-black beetle, 9 to 10 mm. long by 3 to 4 mm. broad, with the posterior angles of the thorax and the wing covers marked by large patches or bands of waxy yellow.

To prevent and offset the injuries caused by this insect several methods of control are available. If the forest could be kept clear of dead and dying trees and of felled trees and their stumps, which afford ideal breeding spots for the development and spread of new broods, the trouble could be easily controlled. Such trees might be used for fuel or they could be piled with the limbs and tops and burned. If trees must be deadened in the lumbering operations, the "deadening" should be done at a time of the year when the sap

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[a] See "On the Study of Forest Entomology in America," Bul. 37, Bur. Ent.

is not actively flowing or, in other words, when it is down. October, November, and December would probably be the best months for this. If the timber has to be felled and left in the woods for a time, the felling should be done during the same months and the logs should be barked and left so that they will dry quickly, which makes them distasteful to the sapwood borer, heartwood borers, pinworms, and other insects. If the timber is found to be newly infested while standing, or on felling, the most practical remedy is to cut it into logs at once and place the logs in a pond or stream so that the larvæ will be destroyed and further damage prevented. If the damage has already been done before the lumberman has noticed the injury, which is usually the case, much loss can often be prevented by utilizing the damaged stuff to the best advantage. It may be used for poles, posts, planking, sills, small construction timbers, or other purposes where the wormholes are not particularly detrimental, but not for cooperage, shipbuilding, shingles, doors, finishing, cabinetmaking, or furniture, where clear stuff is desired, or the loss is apt to be severe, both in the poor quality of the product and in the extra labor taken to produce it.

FIG. 20.—Work of the flat-headed bald cypress sapwood borer (*Acmæodera pulchella* Hbst.): Section of wood showing larval mines on the surface and in the sapwood. One-third natural size. Adult, larva, slightly enlarged. (Original.)

Shade and ornamental trees may be protected from the ravages of this and other flat-headed borers by good culture. The trees should be carefully cultivated and fertilized and protected from injury. All dead limbs and dead spots on the trunk should be carefully cut out and the wounds sterilized and protected by painting with coal tar, or, better still, coal-tar creosote. A vigorous, healthy tree is rarely attacked by borers, and a sickly one is of little use as an ornament or for shade and should be destroyed before it communicates its ailments to its neighbors.[a]

[a] See "Catalogue Exhibits of Insect Enemies of Forests and Forest Products," etc., Bul. 48, Bur. Ent., U. S. Dept. Agr.; "Diseases of Ornamental Trees," Yearbook 1907; "Diseases of Deciduous Forest Trees," Bul. 149, Bur. Plant Ind.

THE FLAT-HEADED BALD CYPRESS HEARTWOOD BORER.

(*Trachykele lecontei* Gory.)

Besides the sapwood borer, the bald cypress is attacked by another flat-headed borer which mines the wood of dead and dying trees. This species excavates mines (fig. 30, *a*, *a*, *a*, *b*, *c*), which can hardly be told from those of the sapwood borer, being only slightly shallower. It has been found from Virginia to Louisiana and may cause more loss than the first species, for it is apt to mine the heartwood as well as the sapwood.

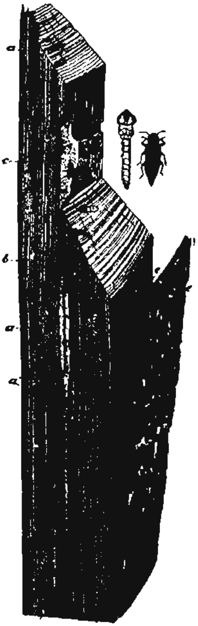

FIG. 30.—Work of the flat-headed bald cypress heartwood borer (*Trachykele lecontei* Gory). Section of trunk of felled tree: *a*, *a*, *a*, Cross sections of larval mines in wood; *b*, longitudinal section of mine; *c*, tangential section of same; *d*, pupal cell in wood; *e*, *e*, adult exit hole in wood and bark. One-third natural size. Adult, natural size; larva, three-fifths natural size. (Original.)

The heartwood borer (fig. 30) can be easily distinguished from the sapwood borer. The larva, when full grown, is nearly twice as long and broader, being about 25 mm. long by 7 mm. broad. It is also flatter. The first thoracic segment is proportionately longer and broader and is marked on the dorsal surface by an inverted V instead of a single median line. The adult (fig. 30) is also larger, being from 12 to 14 mm. long by 4 to 5 mm. broad. It is also different in color, being a medium to dark ashy bronze marked with black velvety spots. It emerges in the spring.

The methods of control are the same as those recommended for the sapwood borer.

THE FLAT-HEADED BIG TREE HEARTWOOD BORER.

(*Trachykele opulenta* Fall.)

Although the famous big trees of California are exceptionally free from injurious insect enemies, there are a few that do attack them. One of these is a close relative of the bald cypress heartwood borer. It excavates long, winding mines (fig. 31, *a*, *b*, *c*), under the bark and through the sapwood and heartwood of living, dying, and dead trees. One young tree, 12 inches in diameter, found by

the writer in the Mariposa Grove, had most of its wood completely riddled by successive broods of larvæ and seemed to have been killed by the attack of this species. The insect is reported from all of the Pacific States and attacks the incense cedar and probably other cedars as well as the big tree.

The larva (fig. 31) closely resembles that of the bald cypress heartwood borer. It varies from 25 to 31 mm. in length, is 6 mm. broad, creamy white in color, and has a similar inverted V-shaped marking on the dorsal surface of the thorax. The adult (fig. 31) is a beautiful velvety green beetle about 12 mm. long by 5 mm. broad. The wing covers are marked with some regular rows of black velvety patches and the entire surface is finely punctured. The emergence takes place in the early summer.

FIG. 31.—Work of flat-headed big tree heartwood borer (*Trachykele opulenta* Fall). Section of trunk of small tree: *a*, Mines of smaller larvæ in wood; *b*, mines of larger larvæ in wood; *c*, mines of larger larvæ in outer surface of wood; *d*, pupal cell in wood; *e*, *c*, adult exit holes in wood and bark. Two-fifths natural size. Adult, larva, two-thirds natural size. (Original.)

The methods of control are the same as those recommended for the cypress sapwood borer, the utilization of the injured stuff being especially recommended.

THE FLAT-HEADED WESTERN CEDAR HEARTWOOD BORER.

(*Trachykele blondeli* Mars.)

One of the most injurious of the flat-headed borers is the western cedar heartwood borer. This close relative of the bald cypress heartwood borer and of the big-tree heartwood borer has seriously injured the timber of many of the finest standing trees of the western red cedar in certain localities in western Oregon and western Washington. One supervisor of a Washington forest writes: "A very large part of the cedar (in this forest) is worm-eaten," and, "the worm-eaten trees are often green and apparently thrifty when the timber is

so full of holes (fig. 32) as to be of little value." An Oregon shingle man sent in a number of shingles (fig. 33) from cedar heartwood which were badly riddled by the flattened oval wormholes, and reported a large amount of timber badly damaged.

The insect is also reported from California and may attack other species of cedar.

The full-grown larva (fig. 32) is creamy white in color, from 25 to 37 mm. long and 6 mm. broad at the broadest part. The V-shaped marking on the dorsal surface of the thorax is a little broader than that of the big-tree borer and the abdomen is not quite so slender. The adult (fig. 32) is quite similar to the adult big-tree borer, but it is larger, 18 mm. long by 6 mm. broad, is of a more golden color, and has a strongly angulate prothorax and a long, shiny golden ridge on the front of the head. It emerges in the spring.

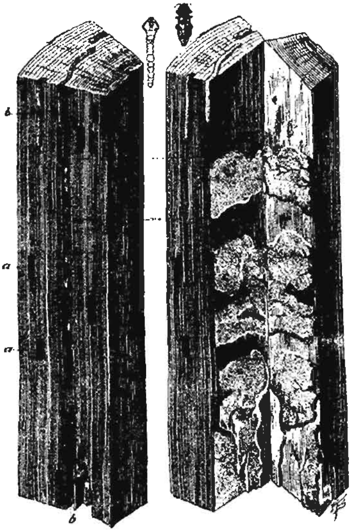

FIG. 32.—Work of the flat-headed western cedar heartwood borer (*Trachykele blondeli* Mars.). Section of wood of main trunk of western red cedar: *a, a*, Cross sections of larval mines; *b, b*, longitudinal sections of same; *c, c*, tangential sections of same. One-third natural size. Adult, larva, one-half natural size. (Original.)

The methods of control are the same as those recommended for the cypress sapwood borer, the utilization of the injured timber probably being the most practical under the present conditions.

THE FLAT-HEADED TURPENTINE HEARTWOOD BORER.

(*Buprestis apricans* Hbst.)

The longleaf pine of the Southern States, when boxed for turpentine, fire-scarred, or otherwise injured, has the sapwood and heart-

wood so badly riddled by the mines of this borer that the trees are often broken over by the wind. This shortens their activity as turpentine producers and also spoils portions of the timber for lumber. One millman placed his loss from this source at 1 per cent totally destroyed and 5 per cent reduced to the lower grades. Injured loblolly pine is mined in a similar manner by this same species. The mines (fig. 34, *a*, *a*, *a*) are oval, 6 by 10 mm. in diameter, and wind back and forth through the sapwood and deep into the heartwood and back to the surface again. They are usually filled with a dense mass of fine, pitchy borings, except where they terminate near the surface of the wood in the enlarged pupal cell (fig. 34, *b*) and exit hole (fig. 34, *c*).

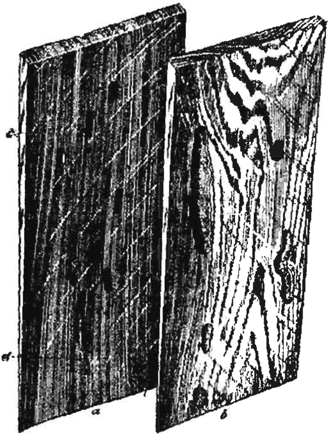

FIG. 33.—Work of the flat-headed western cedar heartwood borer (*Trachykele blondeli* Mars.). Western red cedar shingles badly damaged by the larval mines: *a*, Quarter-sawn shingle showing both cross and longitudinal sections, *c*, *d*, of the larval mines; *b*, bastard-sawn shingle showing same. One-third natural size. (Original.)

The borer (fig. 34) is about 37 mm. long by 9 mm. broad across the thorax, the plates of which are roughened over their entire surface. The dorsal one is marked by a short-trunked Y and the ventral one has a deep median groove which extends from the posterior margin about half way to the anterior one. The color is creamy or dingy white. The adult (fig. 34) is a large, brownish-bronze beetle with eight longitudinal rows of large punctures on each wing cover. It varies from 18 to 23 mm. long by 7 to 9 mm. broad. Emergence takes place during late winter and spring.

For trees under ordinary forest conditions the usual methods of control are recommended. For those boxed for turpentine it is recommended that the boxing be done in the early fall, if possible. Some operators say that the species attacks winter and spring boxed trees, but not those boxed later. As the trees are in a continual state of injury from the operations, it will be difficult to

prevent the insects from inflicting some damage, but it should be lessened as much as possible by using improved forestry methods.[a]

FIG. 34.—Work of the flat-headed turpentine heartwood borer (*Buprestis apricans* Hbst.). Section of longleaf pine wood: *a, a, a*, Larval mines; *b*, pupal cell; *c*, adult exit hole. One-third natural size. Adult, two-thirds natural size; larva, one-half natural size. (Original.)

THE GOLDEN BUPRESTIS.

(*Buprestis aurulenta* Linn.)

Yellow pine and Jeffrey pine in the Rocky Mountain and Pacific States are mined by this species as the longleaf pine is mined by the turpentine borer. Entrance is made through wounds in the bark, and the sapwood and heartwood of the timber are mined (fig. 35). Lightning-struck trees are especially liable to attack.

The borer (fig. 35) is about 37 mm. long by 10 mm. broad. The plates of the thorax are roughened over most of their surface. The dorsal is marked by a Y which has a faint trunk. The Y is surrounded by roughened areas and has a smooth area between the branches. The ventral plate has a broad, roughened, median stripe and a median groove which runs forward about half way from the posterior margin. The adult (fig. 35) is a beautiful golden-green beetle with a distinct, median, thoracic groove, and has four ridges and coppery margins on each wing cover. It varies from 14 to 19 mm. in length by 5 to 8 mm. in breadth. Emergence takes place in spring and early summer.

The usual methods of control are recommended.

THE LARGE, FLAT-HEADED PINE HEARTWOOD BORER.

(*Chalcophora virginiensis* Dru.)

Besides the species already mentioned, the pines in the Eastern and Southern States are attacked by a large, flat-headed borer that riddles the sapwood and heartwood of the main trunk with large oval mines until it is a mere shell and unfit for lumber. This injury has caused

[a] See "A New Method of Turpentine Orcharding," Bul. 40, Bur. Forestry, U. S. Dept. Agr.

serious damage to the large white pine timber in West Virginia. Trees are often found which have every appearance of being perfectly healthy, but on felling are found to be sound for a distance of from 10 to 30 feet from the stump, and then nothing but a shell for the next 10 to 20 feet. The injury appears to start from some slight wound in the bark in which the eggs are deposited. The larvæ hatching from the eggs mine into the sapwood and heartwood until matured, when they return toward the surface and form their pupal cells and exit holes just beneath the surface.

The borer or larva is the largest of the flat-headed borers. When full grown it reaches a length of 50 mm. or more, with a breadth across the thorax of nearly 13 mm. It is creamy white or dingy white in color. The plates of the thorax are well developed and roughened by interrupted rows of dark, raised, chitinous points or ridges. The dorsal one is marked by a distinct dark Y and the ventral one by a distinct, dark, median bisecting line. The adult is a large, dark, bronze, elongate-oval beetle which varies from 23 to 30 mm. long by 8 to 10 mm. broad. The thorax is broader than long, rounded, with a dark, shiny, elevated median line flanked on either side by a rough, grayish groove. The wing covers are marked with dark, shiny, irregular elevations and rough, grayish depressions. Emergence takes place during the spring and early summer.

FIG. 35.—Work of the golden buprestis (*Buprestis aurulenta* L.). Chip from ax wound on trunk of dying Jeffrey pine: *a*, Small larval mine; *b*, large larval mine; *c*, adult exit hole. One-half natural size. Adult, three-fourths natural size; larva, two-thirds natural size. (Original.)

The usual methods of control are recommended.

THE FLAT-HEADED SYCAMORE HEARTWOOD BORER.

(*Chalcophora campestris* Say.)

Injured, dying, and dead sycamore, beech, oak, and other deciduous trees in the Eastern and Southern States have their sapwood and heartwood mined by a large, flat-headed borer. The mines (fig. 36, *a*) are broad, flattened, slightly oval, and up to 9 mm. broad and 3 mm. deep. They usually start from some wound in the bark and wind back and forth through the sapwood and heartwood until they terminate in a large, open pupal cell (fig. 36, *b*), usually near the surface of the wood. The cell opens out to the surface by an oval exit hole (fig. 36, *c*, *d*), about 25 mm. long. The mines are filled with tightly packed dust-like borings.

FIG. 36.—Work of the flat-headed sycamore heartwood borer (*Chalcophora campestris* Say). Section of trunk of dead beech: *a*, Large larval mine in wood; *b*, pupal cell in wood; *c*, adult exit hole in wood and bark; *d*, adult exit hole in wood. One-half natural size. Adult, three-fourths natural size; larva, one-half natural size. (Original.)

The borer (fig. 36) resembles the pine heartwood borer somewhat. It is a little more slender, being 62 mm. long by 9 mm. broad. The brownish elevations that roughen the thoracic plates are more like points than ridges, and the marking on the dorsal plate is more like a V or U than a Y. The ventral plate is marked by a similar median bisecting line. The adult (fig. 36) is a large, grayish-bronze beetle,

with a median groove on the thorax instead of a shiny ridge and fine, raised, interrupted lines on the wing covers instead of shiny raised areas. The wing covers are strongly serrate near the tip. The length varies from 18 to 33 mm. and the breadth from 6 to 9 mm.

Emergence takes place in the spring, and the usual methods of control are recommended.

CONCLUSIONS.

Flat-headed borers undoubtedly cause a large amount of damage to the forest trees of the United States. Unlike damage by fire, this damage is taking place in all localities, usually unnoticed, practically every day in the year. Much of it can be prevented by the use of methods of control recommended by expert forest entomologists. Any evidence of serious injury by flat-headed borers should be reported, with specimens of the borer and its work, to an expert forest entomologist. Specific advice can then be given as to methods of control or a thorough investigation made if the trouble is something new.

APPENDIX.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

Secretary of Agriculture, JAMES WILSON.
Assistant Secretary of Agriculture, WILLET M. HAYS.
Chief Clerk, SYLVESTER R. BURCH.
Solicitor, GEORGE P. MCCABE.
Appointment Clerk, JOSEPH B. BENNETT.
Supply Division, CYRUS B. LOWER, *Chief*.
Weather Bureau, WILLIS L. MOORE, *Chief*.
Bureau of Animal Industry, ALONZO D. MELVIN, *Chief*.
Bureau of Plant Industry, BEVERLY T. GALLOWAY, *Plant Physiologist and Pathologist and Chief*.
Forest Service, HENRY S. GRAVES, *Forester and Chief*.
Bureau of Chemistry, HARVEY W. WILEY, *Chemist and Chief*.
Bureau of Soils, MILTON WHITNEY, *Soil Physicist and Chief*.
Bureau of Entomology, L. O. HOWARD, *Entomologist and Chief*.
Bureau of Biological Survey, C. HART MERRIAM, *Biologist and Chief*.
Division of Accounts and Disbursements, A. ZAPPONE, *Chief and Disbursing Clerk*.
Division of Publications, JOS. A. ARNOLD, *Editor and Chief*.
Bureau of Statistics, VICTOR H. OLMSTED, *Statistician and Chief*.
Library, CLARIBEL R. BARNETT, *Librarian*.
Office of Experiment Stations, A. C. TRUE, *Director*.
Office of Public Roads, LOGAN W. PAGE, *Director*.

PUBLICATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE AND HOW THEY ARE DISTRIBUTED.

By JOS. A. ARNOLD, *Department Editor*.

It is mainly through the issuance and distribution of printed matter that the Department of Agriculture gives effect and practical value to its studies, experiments, and investigations. But the work that the Department can do, and the publications it can print and distribute, are limited by the appropriations made by Congress. In order that, within this limitation, the greatest possible benefit may accrue to the millions of practical farmers, the popular publications—those which tell how to do things—are printed in large editions, and as long as the supply lasts are distributed free to all applicants residing in the United States. The scientific and technical publications, embodying the results of the researches of the Department's scientists and constituting the foundation of many of the popular publications, are larger in size and necessarily more expensive, and are of great value to scientists engaged in similar lines of work in this and other countries, but are not designed nor suitable for indiscriminate distribution, and hence are issued in comparatively small editions and are not given a wide circulation. Under the law of January 12, 1895, persons desiring to procure copies of these scientific publications may purchase the same from the Superintendent of Documents, Government Printing Office, at a nominal price—barely covering the cost of paper and presswork. This policy is believed to be far better for the Department's constituency as a whole than to scatter broadcast all of the expensive reports and bulletins, which would be of little value to the busy people who actually produce the crops and live stock, and the cost of which would so deplete the printing fund as to leave very little for the printing of popular publications.

The following is a brief outline of the Department's publications—which are mainly of three general classes—and the method of distribution:

1. Publications issued annually, comprising the Yearbook, the Annual Reports of the Department, of the Bureau of Animal Industry, of the Office of Experiment Stations, of the Bureau of Soils, and of the Weather Bureau.

These publications are distributed mainly by Senators, Representatives, and Delegates in Congress, although a limited number of copies is always allotted to the

Department. For instance, of the 500,000 copies of the Yearbook the departmental quota is only 30,000, the remaining 470,000 being reserved for distribution by Members of Congress. The Department's supply of publications of this class is reserved almost exclusively for distribution to its officers and special correspondents in return for services rendered, and to libraries, but miscellaneous applicants can usually obtain these documents from some Senator, Representative, or Delegate in Congress.

2. Other departmental reports, bureau bulletins, etc. Of these each main branch of the Department has its separate series, in which the publications are numbered consecutively as issued. They comprise reports and discussions of a scientific or technical character. The Experiment Station Record (monthly) belongs to this class.

The publications of this class are not for distribution by Members of Congress, nor are they issued in editions large enough to warrant free general distribution by the Department. The supply is mainly distributed to small lists of persons who cooperate with or are especially interested in the work of the Bureau, Division, or Office in which the publication originated, or who are rendering some service, and to educational and other public institutions, including libraries. The Department is frequently obliged to refer other applicants to the Superintendent of Documents, Government Printing Office, who is authorized by law to sell all Government publications. In accordance with a provision in the act of January 12, 1905, editions of publications containing more than 100 pages are restricted to 1,000 copies.

3. The Farmers' Bulletins, circulars, Yearbook extracts, and other popular papers. The publications of this class are written in plain language and treat in a practical way of subjects of particular interest to persons engaged in agriculture and similar pursuits. A special appropriation is made by Congress for the publication of these bulletins, and they are issued in large editions and are for free general distribution by the Department.

The Farmers' Bulletins are also for distribution by Senators, Representatives, and Delegates in Congress, each of whom is furnished annually, according to law, with a quota of several thousand copies for distribution to his constituents. Four-fifths of all such bulletins printed with the amount specially appropriated for the purpose are distributed in this way, leaving only one-fifth of them for distribution by the Secretary. It is frequently necessary to refer applicants for these publications in quantities to their Senators, Representatives, or Delegates in Congress because of the insufficiency of the Department's allotment to supply the large and increasing demands for the bulletins.

A limited supply of nearly all of the publications in classes 1 and 2 is, in compliance with the law, placed in the hands of the Superintendent of Documents, Government Printing Office, for sale at a price fixed by him. He is authorized by law to issue, with the approval of the Secretary, new editions of Department publications so long as the demand for them continues, the proceeds of the sales being used to pay for reprints. Applications for these classes of publications should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash, postal money order, express order, or draft covering the amount of the charge. No postage stamps or private checks should be sent. The Superintendent of Documents is not permitted to sell more than one copy of any public document to the same person after the edition has been printed for the Department, but the Public Printer may sell to one person not exceeding 250 copies if ordered before the publication goes to press.

The Secretary of Agriculture has no voice in designating the public libraries in which shall be deposited all public documents. These libraries are designated by Members of Congress and the distribution of public documents to such depositories, including the publications of this and all other Departments of the Government, is a function of the Superintendent of Documents. The Department maintains a list of libraries, which are not public depositories, to which the publications of the Department are sent as issued. All publications of the Department are, therefore, readily available for reference in almost every library in the United States.

The Department has no list of persons to whom all publications are sent, as this method of distribution was long ago found to be wasteful and unsatisfactory. The Monthly List, dated the last day of each month, and containing full information with regard to the publications issued that month, and how the same may be obtained, will be mailed regularly to all who apply for it. The Department also issues and sends to all who apply for it a complete list of all publications of which the supply is for free distribution, and a similar list of the publications that are for sale by the Superintendent of Documents.

Publications of the State agricultural experiment stations are not for distribution by the United States Department of Agriculture. Applications for them should be addressed to the directors of the respective stations.

REVIEW OF WEATHER CONDITIONS OF THE YEAR 1909.

By P. C. Day, *Assistant Chief of Climatological Division, Weather Bureau.*

The following weather summary of the year 1909 is prepared in conformity with the plan by which the National Weather Bulletin was published; that is, by months from January to April, inclusive; by weeks, ending with Monday, from May to the beginning of October; and again by months during the remainder of the calendar year.

Probably the most notable meteorological feature of the year was the remarkably uneven distribution of precipitation during the crop season. While no very large division of the country was entirely without precipitation for any extended time, as was the case over the northeastern part of the United States during the late summer and early autumn of 1908, still many sections suffered severely from lack of sufficient moisture at critical periods in crop growth. At the same time other regions suffered heavily from excessive moisture at periods when drier weather ordinarily prevails.

Taking the season as a whole, probably the regions which suffered most from drought were the interior of the Middle Atlantic States and Oklahoma and the interior of Texas; but in the Middle Atlantic States there was generally enough rain from the latter half of May to the first days of July, while May, July, and August brought heavy rains to most of central and southern Texas. In southern New England, also in southern Wisconsin and adjoining districts the early and middle portions of the summer brought dry conditions, and in Missouri the latter part of the summer.

Remarkably heavy rains fell in parts of the eastern Gulf States in March and April, and again in later May and early June; and large areas in the western corn-growing States, notably in eastern Kansas, southern Iowa, and parts of adjoining States, received very excessive rains about the end of June and the first fortnight of July and again about the middle of September.

The following is a condensed summary of the information collected and published during the year:

January.

January, 1909, was marked by unusual variations in temperature, decided excesses persisting in some localities and deficiencies of equal persistence occurring in others. During the first half of the month remarkably cold weather prevailed over a restricted area along the northern border, from the Great Lakes to the Pacific. In North Dakota, Montana, and northern Idaho minimum temperatures for several days ranged from 20° to more than 50° below zero. During the last half of the month this area experienced generally mild weather. In practically all other parts of the country the month was marked by abnormally mild weather, with but one or two cold spells. In the southern part of the Plains region and in the Gulf States there was a severe cold wave about the 12th. East of the Mississippi River there were a few cold days before the 20th, when a spell of very mild weather came; but a severe cold wave visited nearly all parts of the country east of the Rocky Mountains during the closing days of the month.

The precipitation was decidedly heavy in the Pacific coast region, notably along the central and northern California coast and in the Sacramento Valley. In nearly all parts of the Plateau region the precipitation was considerably above normal, most of it occurring as snow at the higher levels. The precipitation was somewhat above normal in most of Montana, Iowa, and Minnesota, and in eastern South Dakota and western and southern Wisconsin; also generally in the lower Lake region and the northern portions of New York and New England. The amounts were considerable, though usually somewhat less than normal, in the Middle Atlantic States, the Ohio Valley, much of Tennessee and northern Alabama, and on the central Gulf coast. But in most of the Carolinas and Florida, and notably in Texas and adjoining States, there was very little rainfall or none whatever, and large portions of Texas and Florida were greatly in need of moisture when the month ended.

February.

The cold weather prevailing at the end of January continued in the districts to the eastward of the Mississippi for the first two or three days of February, and was felt with especial severity in Florida. Two later cold waves were experienced, about the 10th and the 15th, respectively, in the districts between the Rocky Mountains and the Mississippi, and to some extent outside these limits. The latter of these brought notably low temperatures in Texas. The closing week of the month was cold in the southern Plateau and Rocky Mountain regions. With these exceptions

the month was characterized, in nearly all parts of the country, by decidedly mild weather and monthly mean temperature much above normal, notably in the Middle Atlantic States and the Ohio and upper Mississippi valleys. However, in California, Arizona, and New Mexico the month was generally a little colder than usual, and it was close to normal in some of the States along the northern border.

The precipitation was generally well distributed and heavier than normal in interior and northern districts, save the Plains region. It was remarkably heavy along the immediate Pacific coast and in most of interior California, and, except in the southern Plateau region, was above normal almost everywhere west of the Rocky Mountains. But in Texas, save the eastern portion, the month was decidedly dry, and at most points in Florida, southeastern Georgia, and the Carolinas the precipitation was much less than usual in February. About the middle of the month a very heavy sleet storm prevailed over the Ohio Valley, Lake region, New England, and the northern portion of the Middle Atlantic States.

MARCH.

Between the Appalachian and Rocky Mountains the first ten days and the last week were marked by warm weather, but the intervening period generally by quite cold weather. In other parts of the country there was little decidedly cold weather, except in the central and southern portions of the Rocky Mountain and Plateau regions, where the second week of the month and the last ten days were marked by severe cold. For the month as a whole the temperature was above normal along the Atlantic coast, in practically all parts of the cotton region, and in the upper Lake region, and thence westward to the north Pacific coast. The most unusual warmth was in the upper Missouri Valley.

The precipitation was heavier than normal in portions of California, in southern Arizona and New Mexico, in extreme western Texas, in most of Kansas, and notably in northern Colorado and southern Wyoming. Eastward of the Mississippi there was exceedingly heavy rainfall in Alabama and western Georgia and in parts of the adjoining States. At Montgomery, Ala., the monthly fall was 16.51 inches. In most of northern New England there was very heavy snowfall. The chief regions of deficient precipitation were eastern North Carolina, the vicinity of Lake Michigan, Minnesota, and parts of adjoining States, the north Pacific coast region, Arkansas, and especially eastern, central, and southern Texas, where the long-continued drought had become very serious.

APRIL.

Between the Mississippi River and the Rocky Mountains the month was marked by notably cold weather, also generally in the Lake region, though there the second decade brought some milder days. The temperature was below normal also in most of the northern and middle Plateau region and on the north Pacific coast; and the month averaged colder than normal in the southern Plateau region, owing to cold weather near the close. Along the immediate Atlantic coast the month averaged warmer than usual, though north of the Carolinas the closing days were rather cool. In the South Atlantic and east Gulf States the average temperature was above normal, also in most of Kentucky and Tennessee, though there several cold spells occurred. In nearly all of California the month was decidedly warmer than usual.

To westward of the Mississippi River, except in the States bordering the river, the April precipitation was almost everywhere much less than normal. In central and southeastern Montana and most of Colorado, also in small parts of adjoining States, there was a slight excess, owing chiefly to heavy snowfall. The precipitation was decidedly light in most of the north Pacific coast region, in the eastern portions of the Dakotas and Nebraska, and in most of Kansas and Texas. At the end of the month much the greater part of Texas was in sore need of rain. At Abilene during the five months December to April, inclusive, only 0.83 inch of rain had fallen, less than one-eighth of the normal amount for the period; December and February were quite without precipitation. At San Antonio, though December had given about the normal fall, yet January to April brought but 2½ inches, which is not a third of the usual rainfall of those four months.

To eastward of the Mississippi the chief areas of scanty precipitation included most of Maryland and Virginia, central North Carolina, and especially central and northeastern Florida. All other eastern districts received ample precipitation, and quite excessive amounts fell in eastern North Carolina, southern New England, and most of New Jersey, Pennsylvania, and Ohio. Still more excessive were the falls in the vicinity of Lake Michigan and throughout most of Illinois, and in most of Mississippi and northern Alabama.

There were severe and widespread storms during the last few days of the month, bringing local heavy rainfalls, thunderstorms, high winds, and some tornadoes to many portions of the Mississippi and Ohio valleys and Lake region, while snow fell over the more northern districts between the Rocky Mountains and the Great Lakes. Much damage and some loss of life resulted.

The Period May 1-10, 1909.

The first decade of May was slightly warmer than usual in most Atlantic coast districts, also generally in Arizona, Nevada, and the interior of California; but over most of the country it averaged unseasonably cool, especially in the Missouri and upper Mississippi valleys and in the interior of the east Gulf States, where remarkably cool weather prevailed on the 1st and 2d, with widespread frosts. The light frost at Vicksburg, Miss., on the 2d was the latest on record in spring, and the temperatures recorded that day at both Vicksburg and Meridian were the lowest May readings every taken at those stations.

There was generally little precipitation or none in the country to westward of the Mississippi River, excepting in the north Pacific coast region, at scattered points in the Missouri Valley, and in a small area in central and southeastern Texas; also decidedly heavy rains fell in most of Oklahoma, Missouri, and northern Arkansas, over 4 inches occurring at Springfield, Mo. To eastward of the Mississippi the rainfall was generally of sufficient quantity and well distributed. Heavy falls occurred in most of Indiana and Ohio, in northern New York, and in the mountain region of North Carolina, while the Florida peninsula received very excessive rains.

The Season May 11 to October 4, 1909, by Weeks.

By weeks, ending on Mondays, the weather conditions may be summarized as follows:

May 17.—To westward of the Rocky Mountains the week ending May 17 was decidedly cool, and damaging frosts occurred in Utah, Nevada, and Idaho, and even in northern Arizona. In eastern districts the first days of the week were unseasonably cool, and light frosts occurred as far south as Arkansas and Kentucky, while in most portions of the Gulf States the average temperature for the week was somewhat below normal. Generally throughout the Plains and Lake regions the week was as warm as normal, or slightly warmer, while in New England and the Middle Atlantic States the week averaged decidedly warm for the middle of May, chiefly owing to high temperatures on the closing days.

Good rains occurred in central, southern, and southeastern Texas, in northern Alabama and much of Tennessee, and generally in New England, the Lake region, Wisconsin, and Iowa. There was very heavy rain in eastern Kansas, southeastern Nebraska, and northwestern Missouri. On the other hand, there was no rain or very little on the central and east Gulf coast and in southern Georgia; also in the Plains States and to westward the week was one of dry weather, save in the north Pacific coast region, where moderate rains occurred, and in central and western Montana, southeastern Idaho, and in Utah, where there was heavy precipitation, occurring as snow at the higher levels.

May 24.—To eastward of the Mississippi River uniformly cool weather prevailed, excepting in Florida and northern Michigan, where the temperature averaged normal or slightly higher. To westward of the Rocky Mountains the abnormally cool weather continued, and frosts were of wide occurrence, some damage resulting, notably in parts of Wyoming, Nevada, Oregon, and Washington. Between the Rockies and the Mississippi the temperature averaged about normal, or, especially in South Dakota, somewhat higher.

Little rain, or locally none at all, fell in the upper Mississippi Valley, the Lake region, and New England, and in the southeastern and western portions of Texas there was little. To westward of the Rocky Mountains there was very little precipitation, and none at all in most of California and southern Arizona. Except in these districts there was almost everywhere abundant rainfall, the good showers in central, northern, and northwestern Texas being of great benefit. The amounts were remarkably heavy in parts of Oklahoma, Louisiana, and Mississippi, in southeastern Florida, northern Georgia, and parts of the Carolinas. In Virginia and Maryland, though less heavy, they were ample to end a long dry spell.

Severe hail and wind storms occurred in several counties of Texas.

May 31.—Abnormally cool weather continued in the greater part of the country to westward of the Rocky Mountains and even extended to a large part of the Plains region. However, in western California and most of Montana the week averaged

seasonably warm. In most of Utah, New Mexico, Wyoming, Colorado, and Nebraska the deficiency in temperature equaled or exceeded 6° per day, and serious frosts occurred in Wyoming and the northern portions of Arizona and New Mexico, and less damaging ones in several other States. The week averaged slightly warmer than usual in most of Minnesota and the upper Lake region, also generally on the Atlantic and Gulf coasts and in the interior of Texas.

The precipitation of the week was fairly well distributed. The northern half of the country, from the Mississippi River westward, received a fair supply of rain nearly everywhere save in Montana. But along the southern border there was no rain at all from central Texas westward to the Pacific. Most of the Lake region, southern New England and New York, West Virginia, eastern North Carolina, and the Florida Peninsula had little or no rain. On the other hand there was excessively heavy rain in much of the Dakotas, Missouri, and Illinois, while more excessive rains fell in much of Mississippi and northern Louisiana, and portions of Texas, Arkansas, and Alabama. In parts of central Mississippi over 13 inches of rain fell during the week. In parts of New York, eastern North Carolina, and eastern Florida the need of rain was felt at the close of the week.

June 7.—A decided change to warmer weather occurred in the western half of the country, and temperatures higher than usual during the first week of June were the rule, especially in the Plateau region and in southern California. In the remainder of the country the week averaged about as warm as usual, except in an area covering the central Gulf States, Arkansas, and western Tennessee, where the temperature averaged somewhat below normal.

To westward of the Rocky Mountains there was very little rain, save on the coast of Washington. Most stations in California, Arizona, and Nevada reported no rainfall whatever, or the merest trace. East of the Rocky Mountains the rainfall was well distributed, save that only small portions of Montana and Oklahoma received much, and only the northern parts of Arkansas and Kansas, while in the interior of Texas only the central and a few eastern counties had good showers. In several districts the rainfall was very heavy, notably in the southern portions of Louisiana, Mississippi, and Alabama, and to a less extent in portions of the Carolinas and Ohio.

The warmth in the mountain regions of the West caused rapid melting of the snow, and high water in most streams resulted.

June 14.—In western Oregon the week averaged warmer than normal, also in all parts of the cotton region and most of the Ohio Valley. In the remainder of the country the weather generally averaged cool for June, and there was a marked deficiency of temperature in the northern Rocky Mountain region, throughout the Missouri Valley, save the lower portion, and in most of Minnesota, Wisconsin, and Pennsylvania.

To westward of the Rocky Mountains there was light rainfall in much of the northern Plateau region, but practically none elsewhere. The rainfall was light along most of the northern border east of the Dakotas, and there was little or no rain on most of the South Atlantic coast and in the southern portions of most of the Gulf States, save Louisiana. Otherwise the country east of the Rockies received abundant rains in practically all districts. Decidedly heavy falls occurred in the western portions of South Dakota and Nebraska, and in much of Kansas, Iowa, and northern Missouri; also most of Kentucky and West Virginia received quite heavy rains.

June 21.—The week was warm for the season in most of the Plains region, notably the northern part, also generally in Idaho and Oregon, and in the South Atlantic States. On the other hand the temperature averaged decidedly low for June in the interior of California, and in Illinois, southern Michigan, the lower Lake region, and the Ohio Valley. Toward the end of the week warmer weather set in over the great valleys and Lake region.

Light showers visited most of California and Oregon, and rather heavy falls for the region occurred in central Idaho and western and northern Montana. Good showers fell also in most of northern Texas, eastern Oklahoma, the middle and lower Missouri Valley, and the valley of the Red River of the North. On the Gulf coast as far west as the central Texas coast there were good showers. Except in these localities there were only a few scattered districts to westward of the Mississippi River where rain fell in amounts sufficient to be of benefit, and Arizona and southern New Mexico were experiencing great need of rain. To eastward of the Mississippi there was abundant rainfall almost everywhere save in the Lake region, where only scattered districts received much. The amounts were generally larger in the Southern States, and quite heavy falls occurred on the central Gulf coast and in portions of Florida and South Carolina. In Maine the rain ended a comparatively dry period which had lasted for several weeks.

June 28.—On most of the Pacific coast and generally in Idaho, Montana, and North Dakota, the week averaged cool for the season. Over practically all the rest of the country it was warmer than normal, and it was an especially hot week over the Lake region, the Middle Atlantic States, and New England. At several stations in New England and New York the average temperature was 10° or more above the normal, the severe heat prevailing throughout the week.

There was scarcely any rain in New England, where the need of rain was widely felt, and generally in New York, throughout the Lake region, save in southern Michigan, and along the coast as far southward as Georgia the rainfall was scanty. Several portions of the Gulf coast and much of Arkansas received little rain. With these exceptions practically all the country westward almost to the Rockies had sufficient rain, but farther west hardly any rain fell except on the immediate coast of Washington. Notably heavy rain occurred in most of Iowa and Ohio and portions of the States bordering them. Much damage was done in some localities in Iowa by heavy hail and high winds, while parts of Ohio and Indiana suffered from floods.

July 5.—Generally high temperatures continued, as during the preceding week, over nearly all districts until near the end of the week, when a decided change to cooler weather set in over the northern districts from the upper Mississippi Valley eastward. The change in temperature was so great that for most of New England, the Middle Atlantic States, the upper Ohio Valley, and the Lake region the average temperature of the week was below normal. Also in most Pacific coast districts, save southern California, the week was cool for midsummer. In almost all of the rest of the country the week averaged warmer than normal, and there was a marked excess in temperature in the Plateau region and the central and northern portions of the Rocky Mountains and the Great Plains.

The rainfall of the week was not nearly so well distributed as in most of the preceding weeks of the season. The greater part of New England and eastern New York, of Tennessee and the Carolinas, and of the region along or near the Gulf coast as far westward as western Louisiana received good rains, as did most of the Mississippi Valley up to northern Illinois, nearly all the Missouri Valley, the region around Lake Michigan, most of Kansas, Arkansas and western Texas, and the middle and lower portions of the Rio Grande Valley. Very heavy rains occurred locally in the Red River of the North Valley, in eastern Nebraska and northwestern Missouri, and in extreme southern Texas, while on the west coast of the Florida peninsula the rains were torrential, exceeding 15 inches at a number of stations. To westward of the Rocky Mountains the rainfall was enough to be beneficial in only a few scattered districts, including parts of Nevada and Utah, while scattered showers, mostly light, in Arizona and New Mexico, gave local relief from the dry conditions.

The high temperatures and excessive humidity for several days produced conditions very trying to animal life, and some loss of human life was reported.

July 12.—Temperatures well below normal prevailed in the Atlantic coast States from the Carolinas northward and in the northern and central Plateau region. The week averaged somewhat warmer than usual in the upper Lake region, and much warmer than normal in the lower Mississippi Valley, Oklahoma, and most of Texas, New Mexico, and Kansas. The temperatures in the remainder of the country averaged not far from normal.

The rainfall was irregularly distributed. Around Lakes Ontario and Superior there were fair amounts, but the balance of the Lake region, and most of New England and the Middle Atlantic States had little rain or none, and the same was true for a large part of Texas. Good rains fell along the northern border from Minnesota westward, and there were but few portions of the Missouri, Mississippi, and Ohio valleys, and the South Atlantic and east Gulf States that did not have ample rain. Indeed the rains were very excessive throughout a belt covering most of Georgia, Tennessee, and Kentucky, central Illinois, the greater portions of Missouri and southern Iowa, and the eastern parts of Nebraska and Kansas. From 8 to 12 inches fell at some stations in Kansas. Floods resulted from these heavy rains, and much damage was done in the lower Missouri and middle Mississippi valleys.

July 19.—In the Ohio and upper Mississippi valleys and the Lake region the week averaged slightly cooler than normal; also in the States along the northern border from Minnesota to Washington, and in Oregon. Otherwise the week was generally warmer than usual, especially in Louisiana, Texas, and New Mexico.

The precipitation was generally less than in preceding weeks, and was not well distributed. Ample rains fell in eastern North Dakota, northern Minnesota, the vicinity of Lake Superior, most of northern New England, and eastern Pennsylvania, and generally throughout the Ohio Valley and the South Atlantic and east Gulf States. There were good rains also in most of Arkansas, northeastern Oklahoma, and southern Kansas, and in much of Arizona and northern New Mexico. The remainder

of the country had but little rain or none, the latter being the case in most of California, Nevada, and Idaho.

At the end of the week considerable portions of each of the Middle Atlantic States were in need of rain, also much of Texas, southern Oklahoma, and Wisconsin.

July 26.—Cool weather for the season was the rule over most of the country, notably in the Ohio Valley, Middle Atlantic States, and New England. Along the Gulf coast and generally in the Dakotas and the States to westward of them the week averaged slightly warmer than usual.

Rain in moderate to ample amounts fell along and near the northern border from Montana to New York, also in southern and western New England, and in most of the Middle Atlantic States except Virginia. Most of Georgia and Florida received good rains, also nearly all parts of the Gulf States, and fair amounts fell in the lower Missouri Valley, in New Mexico, and northeastern Arizona. In the parts of the country not mentioned there was little or no rain; and the week was, for the country as a whole, one of the dryest thus far during the summer. However, the rains were decidedly excessive in northern Minnesota, where Duluth received over 8 inches, and in central and southwestern Texas, where a tropical storm broke up, after causing high winds and some loss of life as it moved inland from the Gulf.

August 2.—Cool weather prevailed to eastward of the Mississippi River during the first days of the week, but much hotter weather toward the close. The temperature of the week averaged close to or above normal in all districts east of the Rocky Mountains save central Montana. The excess was greatest in Maine, the upper Lake region, and especially in Oklahoma, Kansas, and northern Texas, where the entire week was marked by high temperatures. Beyond the Rocky Mountains it was a cool week for summer, notably in the central and northern Plateau regions. In many of the north Central States the highest temperatures of the summer were recorded during this week.

In Maryland and the States to northward and northeastward the precipitation was generally very light, and the greater portion of this region was suffering from droughty conditions as the week closed. Likewise in central and southern Wisconsin and the adjacent portions of Minnesota and Iowa little rain fell during the week, and the need of it was increasing. It was a dry week in much of the central and lower Mississippi Valley, while farther westward there was a fair amount of rain only in Kansas, Nebraska, and parts of adjoining States, and in Montana and northern Idaho. Along practically all the Mexican boundary and in most parts of California and Nevada no rain whatever fell. The chief area that received considerable rain included the central Lake region and districts southward over the Ohio Valley to the South Atlantic and east Gulf States with southern Louisiana; but in many of the Southern States there were complaints of irregular distribution, numerous places getting very little rain or none, while points near by received copious showers. Heavy local falls were reported from southern Louisiana, North Carolina, and the Virginias.

August 9.—The week averaged cool for the season in most Atlantic coast districts and in the southern Appalachian region, also to westward of the Rocky Mountains, especially in Washington and northern Idaho. In nearly all the rest of the country it was a hot week, notably in an area extending from Oklahoma northeastward to the upper Lake region. Unusually high temperatures prevailed in the central Plains region on or about the 6th, while at the same time very low temperatures for early August prevailed west of the Rockies.

In practically all parts of the Pacific States, western New York, and central Pennsylvania there was no rain at all. The precipitation of the week was less than in most preceding weeks, and occurred mostly as local showers, which were chiefly confined to three areas. The first embraced Arizona and most of New Mexico, the second extended from central Kansas northward over eastern Nebraska to the valley of the Red River of the North, while the third covered eastern Texas and the States to eastward and northeastward as far as the Virginias, thence only the immediate coast districts to New York, the Hudson Valley, and most of New England save Maine. Decidedly heavy rains fell in small areas in the eastern part of the Dakotas, in northwestern Minnesota, in southern Louisiana, and in South Carolina, and northern Georgia.

August 16.—During the first part of the week cool weather prevailed in the eastern part of the country, and the week averaged cool for the season in most Atlantic coast States north of the Carolinas. Otherwise the week was a decidedly warm one for all districts east of the Rocky Mountains, especially for the Missouri and central Mississippi valleys. In California and parts of adjoining States the temperature averaged below normal.

In most of Kansas, Nevada, and the Pacific coast States there was absolutely no rain. Ample rains fell in large parts of Arizona, New Mexico, Colorado, Utah, and southeastern Idaho, also in northern Nebraska, northern Texas, and southwestern

Oklahoma. To eastward of the Missouri and lower Mississippi rivers and on the west Gulf coast there was generally ample rain, the chief exceptions being Missouri and southern Iowa, where the need for rain was becoming serious, and Pennsylvania, New York, and New England, where relief from dry conditions was had only near the Great Lakes and in northern Maine. In Maryland the drought was partially relieved and in Wisconsin and northeastern Iowa completely. Many stations in the latter district received over 7 inches, and very heavy rains fell also in parts of Minnesota, Ohio, and western Florida.

August 23.—Cool weather for the season prevailed in the Northeastern States, as far westward and southward as Lake Michigan, Illinois, and Georgia. Elsewhere the average temperature of the week was generally above normal, notably in the Missouri Valley, the Plains region, and the western Gulf States. In Oklahoma, Texas, Arkansas, and Louisiana remarkably high temperatures were recorded on the first three days of the week.

Abundant rains for the district occurred generally in the central and southern Rocky Mountain and Plateau regions, culminating near Yuma, Ariz., where over 3 inches fell within the week, more than the whole average annual rainfall; but for the country as a whole it was a week of very little precipitation. Small areas in central Texas, northern Nebraska, and southeastern Michigan had good rains, and there was ample rain over the coast districts from Mississippi to the Carolinas and in portions of New England, New York, New Jersey, and Pennsylvania. In Oklahoma and generally throughout the central valleys there was much need of rain.

August 30.—The weather was variable as to temperature, but averaged warmer than normal almost everywhere save in Montana and Washington. The departure from normal was rather large in most northeastern districts and in the central and lower Missouri Valley. Generally in the Plains region and Mississippi Valley this was the fifth consecutive week of weather hotter than usual for the period.

The rainfall was chiefly confined to a few regions. There was considerable in northwestern Washington, and generally fair amounts in New Mexico and parts of Colorado, South Carolina, and eastern Florida. Rain fell quite generally also in two larger areas, the first embracing most of Illinois and the Lake region, the other the central and western Gulf coast, including eastern, central, and northern Texas and most of Oklahoma. Quite heavy falls occurred in parts of Louisiana, and especially in extreme southern Texas, where they resulted from a severe tropical storm which moved from the Gulf into northern Mexico. The portions of the country not already named had, as a rule, very little rain or none.

September 6.—The week averaged warmer than usual in the Gulf States and southern part of the Plains region, also in Montana and Wyoming and the States to westward of them. In Washington and Oregon it was a remarkably warm week. But in most of California and Arizona it was cooler than normal, and decidedly so in all northeastern districts, especially in the Lake region and the upper Mississippi Valley. Frosts were reported by many stations in the northern portions, and in northern New England freezing temperatures occurred at a few points.

In the Pacific coast region there was no rain, or very little, and in Texas but few portions received good showers. Yet otherwise most of the country west of the Mississippi had considerable rain, notably southeastern Idaho and most of Arizona, Nebraska, and eastern Colorado. Most of Minnesota received little, also parts of Missouri and Arkansas, where it was much needed. To eastward of the Mississippi River the falls were generally light. Most of New England had a fair supply, and along the immediate South Atlantic coast considerable rain occurred. In Florida locally heavy rains fell, and toward the close of the week the dry conditions in Tennessee were widely relieved.

September 13.—Along the immediate Atlantic coast and throughout New York and New England the week averaged slightly cooler than normal, and in Utah and adjoining parts of other States there was a marked deficiency of temperature. In most other districts the temperature was variable, but it averaged usually well above normal. The excess was marked in the Dakotas and Minnesota, and more marked in Oklahoma and Arkansas, where the mean temperatures at some stations were 12° above normal.

Light to occasionally damaging frosts occurred in much of the Lake region and in the northern portions of New York and New England, also at exposed points in the mountain regions of the West.

Texas, save the Panhandle, and California received practically no rain. To westward of the Mississippi ample rainfall was practically confined to Montana, Colorado, Kansas, Missouri, Iowa, and eastern Nebraska. In Missouri the drought was thoroughly broken, while in northeastern Kansas extraordinarily heavy falls occurred, Topeka reporting 9 inches. To eastward of the Mississippi River there was little

rain in more northern districts, also in the southern Appalachian region; but otherwise there were considerable amounts in nearly all portions, and in most of the Middle Atlantic States the drought was much relieved.

September 20.—In the central and southern Rocky Mountain region the week averaged rather cool for the season, and in most other western districts parts of the week were quite cool. Much the greater portion of the country had temperatures averaging close to normal or somewhat above, but the excess was marked only in California and southwestern Oregon. At Los Angeles the average temperature was 12° higher than usual in mid-September.

Rainfall of consequence was practically confined to southwestern Texas, the Gulf coast districts, the South Atlantic States, West Virginia, Missouri, Iowa, Minnesota, Wisconsin, and northern Illinois. Decidedly heavy precipitation occurred only in parts of Georgia and South Carolina and in a few widely scattered localities elsewhere. For much the greater part of the country it was a very dry week.

September 27.—Along the northern border, save in Washington, the week averaged slightly warmer than normal, also in most of Florida and California. Elsewhere the mean temperature was generally somewhat below normal, notably in the middle Mississippi Valley. In the Rocky Mountain region and to eastward the week generally began with warm weather and ended with cool. Heavy to killing frosts occurred over large portions of the mountain and Plateau regions and generally along the entire northern border, while light frosts visited portions of the corn-growing States.

To westward of the States bordering the Mississippi River there was very little precipitation, especially in the southern districts. But in those States and to eastward there were ample amounts almost everywhere, the chief exceptions being the upper and middle Ohio Valley, central Tennessee, and the coast districts of Georgia and North Carolina. Heavy rain fell in the lower and middle portions of the Mississippi Valley, in connection with the northward movement from the Gulf to the Lake region of a severe tropical storm, which caused much damage along and near the central Gulf coast. In most of New England and a large part of the Middle Atlantic States the rainfall was larger than normal, and much relief from drought was experienced.

October 4.—In the lower Lake region, the Virginias, and the Carolinas the week was quite cool for the season, and the temperature averaged below normal almost everywhere east of the Mississippi River, also in Louisiana, most of Texas and Nevada, and notably in California. In the rest of the country it was a warm week for the season, especially in the central and northern portions of the Great Plains and the Rocky Mountain region. In eastern Montana the week averaged 12° warmer than normal.

Showers fell in some of the coast districts of Florida and North Carolina, but otherwise there was no rain at all in the cotton-growing States or anywhere between the Mississippi River and the Rocky Mountains. Considerable rain fell in Idaho, Nevada, parts of Oregon, and central and northern California. In California this was the first important rain of the fall season. In New England and most of New Jersey and New York there was considerable rain, and heavy amounts fell in northern Maine. But for the country as a whole this was probably the dryest week of the year.

Heavy to killing frosts formed early in the week as far south as the Ohio River and the mountain portions of the Virginias, while portions of all the eastern cotton States, even Florida, reported light frost.

REVIEW OF THE SEASON.

For the period from March 1 to September 30 the mean temperature was practically everywhere within 2° of normal. There was generally a slight excess along the immediate Atlantic coast, in the cotton region, and in the Great Plains region, also on the shores of Lakes Michigan and Huron. There was a deficiency in the lower Lake region and upper Ohio Valley, in the upper Mississippi Valley, and everywhere to westward of the Rocky Mountains save on the immediate coast of California.

The precipitation of the crop season was deficient by as much as 10 inches on part of the coast of North Carolina, in southeastern Oklahoma, and in northern and much of central Texas, while it was deficient by as much as 4 inches in south-central New York and in the greater portions of the other Middle Atlantic States, in the eastern portions of the Carolinas, in southeastern Georgia, and northeastern Florida, in most of upper Michigan, in northwestern Arkansas, and southwestern Missouri, and along the southern edge of Kansas, in practically all of Texas, save the coast, and of Oklahoma, and in most of northern California and the western portions of Oregon and Washington. The precipitation from March to September, inclusive, was in excess by as much as 8 inches in extreme southern Florida, in most of the mountain districts of North Carolina, Tennessee, and Georgia, in Alabama, save the southeastern portion, in Mississippi,

save the northern and western portions, in southeastern Louisiana, in most of northern Indiana and along the eastern shore of Lake Michigan, and locally in Kansas, Missouri, and Iowa. In some other districts there were excesses of 4 inches or more, but otherwise the portions of the country not named received very nearly the normal amounts.

October.

Cool weather for the season prevailed in the central and southern portions of the Plateau region in the latter part of the first decade, almost everywhere east of the Rockies during the second decade, and generally to eastward of the Mississippi during the last decade. Warm weather for the season prevailed in the central valleys and in New England during the opening days, in the central Plateau region during the middle third of the month, and generally to westward of the Mississippi River during the last third. For the month as a whole there were no marked departures from the normal, but generally to westward of the Mississippi River and in the east Gulf States the month averaged warmer than usual, and in most eastern districts a little cooler. A period of unseasonably cold weather visited the Missouri and upper Mississippi valleys about the 11th to 14th, when damaging frosts reached considerable portions of the cotton region. Heavier frosts occurred generally during the last week of the month, especially in the South Atlantic States, practically only the coast regions escaping.

No rain fell in southern Arizona and southeastern California. For the rest of the country very much the larger part had less than the normal fall. The chief regions of precipitation greater than normal included Oregon and parts of adjoining States, the Gulf coast and central Texas, central Kansas, and the larger portions of Missouri, Illinois, Indiana, Ohio, and West Virginia. Remarkably heavy rain was confined to southern Florida, occurring on the 11th and 12th, when a violent and destructive tropical storm visited the section. The drought which had prevailed for many weeks in Oklahoma was much relieved by rains about the 8th and the 18th, though unfortunately these were not well distributed.

November.

For the month as a whole mild weather prevailed, and the average temperature was especially above normal in an area reaching from the west Gulf States northward and northeastward to the Lake region. Only in the southern portions of California and the Plateau region did the month average cooler than usual. However, cold spells visited the Missouri and upper Mississippi valleys about the 7th–9th, and nearly the entire country west of the Appalachians about the middle of the month. Unusually high temperatures for November occurred in the northeastern States on the first days and about the 12th, and in the interior valleys about the 3d to 7th.

Almost everywhere west of the Mississippi River the precipitation was more than usual in November, the principal exceptions being Montana and North Dakota, Louisiana, Texas, save the northern and northwestern portions, and the southern parts of New Mexico and Arizona. But only in small areas were the amounts remarkably large. In western Oregon and Washington alone did they exceed 8 inches over a considerable area, but in a narrow strip reaching from Oklahoma and central Kansas to southeastern Minnesota over 6 inches fell. To eastward of the Mississippi the precipitation exceeded the normal in parts of New England, and in most of the Lake region, Illinois, and Wisconsin; otherwise there was almost everywhere a marked deficiency. Generally in the South Atlantic and the interior of the Middle Atlantic States there was less than an inch of rain, and in large parts of the Middle Atlantic States and Florida there was great inconvenience from the scanty water supply.

December.

In northern Michigan the mean temperature for December was practically normal, and the Maine stations and San Luis Obispo, in California, reported means slightly above normal. All other reports received indicated that the month had averaged colder than usual, generally much colder. A belt from Illinois westward to the central and northern Plateau region had average temperatures 9° or more below normal, Lander, Wyo., having a departure of 15°, while at Independence, Cal., the month averaged 16° below normal. In most districts the first days of the month were marked by mild weather, but by the 3d severe cold had set in in Montana, and by the 7th had covered practically the whole country, the central and northern parts of the Great Plains experiencing remarkably cold weather for early December. The middle third of the month was decidedly cold in practically all interior districts, and the

closing days brought especially severe weather in the Atlantic coast States. However, a change to warm weather occurred in most districts between the Rockies and the Appalachians, save the east Gulf States, during the last few days of the month.

Generally to eastward of the Mississippi River and in the first row of States to westward, save Minnesota, the month brought considerable precipitation, quite well distributed. But in eastern and southern Florida very little fell, and dry conditions continued. Indeed, few districts east of the Mississippi had precipitation in excess of the normal, save the eastern portions of the Middle Atlantic States, where good rains about the middle of the month were of great benefit, the vicinity of Lake Michigan, where there was heavy snowfall, and the region near the Gulf coast from the Apalachicola River westward. Southern Alabama and Mississippi, southwestern Arkansas, and most of Louisiana and eastern Texas received rather heavy rains. In general, the regions west of the Mississippi received more than normal precipitation, but western and southern Texas, eastern New Mexico, most of Montana, Idaho, Washington, Oregon, and northern California had less than normal. However, between San Francisco and Los Angeles the coast districts of California received decidedly heavy rains, and snowfall heavier than usual occurred generally throughout the central Plateau region, central and northern portions of the Rocky Mountain region and the Great Plains, and the Missouri and upper Mississippi valleys; also in the greater part of the northeastern States, where it was due to the severe storm of the 25th-26th.

Frosts and even freezing weather reached nearly all parts of Florida, California, and southern Texas, including many regions seldom visited by such low temperatures.

AGRICULTURAL COLLEGES IN THE UNITED STATES.[a]

College instruction in agriculture is given in the colleges and universities receiving the benefits of the acts of Congress of July 2, 1862, August 30, 1890, and March 4, 1907, which are now in operation in all the States and Territories, except Alaska. The total number of these institutions is 67, of which 65 maintain courses of instruction in agriculture. In 23 States the agricultural colleges are departments of the state universities. In 15 States and Territories separate institutions having courses in agriculture are maintained for the colored race. All of the agricultural colleges for white persons and several of those for negroes offer four-year courses in agriculture and its related sciences leading to bachelors' degrees, and many provide for graduate study. About 50 of these institutions also provide special, short, and correspondence courses in the different branches of agriculture, including agronomy, horticulture, animal husbandry, poultry raising, cheese making, dairying, sugar making, rural engineering, farm mechanics, and other technical subjects. The officers of the agricultural colleges engage quite largely in conducting farmers' institutes and various other forms of college extension. The agricultural experiment stations with very few exceptions are departments of the agricultural colleges. The total number of persons engaged in the work of education and research in the land-grant colleges and the experiment stations in 1909 was 6,997; the number of students in these colleges, 73,813; the number of students (white) in the four-year college courses in agriculture, 5,380; in short and special courses, 9,017. There were also 1,442 students in agriculture in the separate institutions for negroes. With a few exceptions, each of these colleges offers free tuition to residents of the State in which it is located. In the excepted cases scholarships are open to promising and energetic students; and, in all, opportunities are found for some to earn part of their expenses by their own labor. The expenses are from $125 to $300 for the school year.

[a] Including only institutions established under the land-grant act of July 2, 1862.

Agricultural colleges in the United States.

State or Territory.	Name of institution.	Location.	President.
Alabama	Alabama Polytechnical Institute.	Auburn	C. C. Thach.
	Agricultural School of the Tuskegee Normal and Industrial Institute.	Tuskegee Institute	B. T. Washington.
	Agricultural and Mechanical College for Negroes.	Normal	W. S. Buchanan.
Arizona	University of Arizona	Tucson	K. C. Babcock.
Arkansas	College of Agriculture of the University of Arkansas.	Fayetteville	C. F. Adams.[a]
	Branch Normal College[b]	Pine Bluff	Isaac Fisher.
California	College of Agriculture of the University of California.	Berkeley	E. J. Wickson.[a]
Colorado	The State Agricultural College of Colorado.	Fort Collins	C. A. Lory
Connecticut	Connecticut Agricultural College	Storrs	C. L. Beach.
Delaware	Delaware College	Newark	G. A. Harter.
	State College for Colored Students	Dover	W. C. Jason.
Florida	University of the State of Florida	Gainesville	A. A. Murphree.
	Florida Agricultural and Mechanical College for Negroes.	Tallahassee	N. B. Young.
Georgia	Georgia State College of Agriculture.	Athens	A. M. Soule.
	Georgia State Industrial College	Savannah	R. R. Wright.
Hawaii	College of Hawaii	Honolulu	J. W. Gilmore.
Idaho	College of Agriculture of the University of Idaho.	Moscow	E. E. Elliott.[a]
Illinois	College of Agriculture of the University of Illinois.	Urbana	E. Davenport.[a]
Indiana	*School of Agriculture of Purdue University.*	*Lafayette*	*J. H. Skinner.*[a]
Iowa	Iowa State College of Agriculture *and Mechanic Arts.*	Ames	A. B. Storms.
Kansas	Kansas State Agricultural College	Manhattan	H. J. Waters.
Kentucky	State University	Lexington	J. K. Patterson.
	The Kentucky Normal and Industrial Institute for Colored Persons.	*Frankfort*	*J. H. Jackson.*
Louisiana	*Louisiana State University and* Agricultural and Mechanical College.	*Baton Rouge*	*T. D. Boyd.*
	Southern University and Agricultural and Mechanical College.	New Orleans	H. A. Hill.
Maine	The University of Maine	Orono	G. E. Fellows.
Maryland	Maryland Agricultural College	College Park	R. W. Silvester.
	Princess Anne Academy for Colored Persons, Eastern Branch of the Maryland Agricultural College.	Princess Anne	F. Trigg.
Massachusetts	Massachusetts Agricultural College.	Amherst	K. L. Butterfield.
	Massachusetts Institute of Technology.[b]	Boston	R. C. Maclaurin.
Michigan	Michigan State Agricultural College.	East Lansing	J. L. Snyder.
Minnesota	College of Agriculture of the University of Minnesota.	University Farm, St. Paul.	A. F. Woods.[a]
Mississippi	Mississippi Agricultural and Mechanical College.	Agricultural College	J. C. Hardy.
	Alcorn Agricultural and Mechanical College.	Alcorn	L. J. Rowan.
Missouri	College of Agriculture and Mechanic Arts of the University of Missouri.	Columbia	A. R. Hill.
	School of Mines and Metallurgy of the University of Missouri.[b]	Rolla	L. E. Young.[c]
	Lincoln Institute	Jefferson City	B. F. Allen.
Montana	Montana Agricultural College	Bozeman	Jas. M. Hamilton.
Nebraska	College of Agriculture of the University of Nebraska.	Lincoln	E. A. Burnett.[a]
Nevada	College of Agriculture of the University of Nevada.	Reno	J. E. Stubbs.
New Hampshire	New Hampshire College of Agriculture and the Mechanic Arts.	Durham	W. D. Gibbs.
New Jersey	Rutgers Scientific School (The New Jersey State College for the Benefit of Agriculture and the Mechanic Arts).	New Brunswick	W. H. S. Demarest.
New Mexico	New Mexico College of Agriculture and Mechanic Arts.	Agricultural College	W. E. Garrison.
New York	New York State College of Agriculture at Cornell University.	Ithaca	H. J. Webber.[d]

[a] Dean.
[b] Does not maintain courses in agriculture.
[c] Director.
[d] Acting director.

Agricultural colleges in the United States—Continued.

State or Territory.	Name of institution.	Location.	President.
North Carolina	The North Carolina College of Agriculture and Mechanic Arts.	West Raleigh	D. H. Hill.
	The Agricultural and Mechanical College for the Colored Race.	Greensboro	J. B. Dudley.
North Dakota	North Dakota Agricultural College.	Agricultural College	J. H. Worst.
Ohio	College of Agriculture of the Ohio State University.	Columbus	H. C. Price.[a]
Oklahoma	Oklahoma Agricultural and Mechanical College.	Stillwater	J. H. Connell.
	Agricultural and Normal University.	Langston	I. E. Page.
Oregon	Oregon State Agricultural College	Corvallis	W. J. Kerr.
Pennsylvania	The Pennsylvania State College	State College	E. E. Sparks.
Porto Rico	University of Porto Rico	San Juan	E. G. Dexter.
Rhode Island	Rhode Island State College	Kingston	Howard Edwards.
South Carolina	The Clemson Agricultural College of South Carolina.	Clemson College	W. M. Riggs.[b]
	The Colored Normal, Industrial, Agricultural, and Mechanical College of South Carolina.	Orangeburg	T. E. Miller.
South Dakota	South Dakota State College of Agriculture and Mechanic Arts.	Brookings	Robert L. Slagle.
Tennessee	College of Agriculture of the University of Tennessee.	Knoxville	C. D. Schmitt.[a]
Texas	Agricultural and Mechanical College of Texas.	College Station	R. T. Milner.
	Prairie View State Normal and Industrial College.	Prairie View	E. L. Blackshear.
Utah	The Agricultural College of Utah	Logan	J. A. Widtsoe.
Vermont	University of Vermont and State Agricultural College.	Burlington	M. H. Buckham.
Virginia	The Virginia Agricultural and Mechanical College and Polytechnic Institute.	Blacksburg	P. B. Barringer.
	The Hampton Normal and Agricultural Institute.	Hampton	H. B. Frissell.
Washington	State College of Washington	Pullman	E. A. Bryan.
West Virginia	West Virginia University	Morgantown	D. B. Purinton.
	The West Virginia Colored Institute.	Institute	Byrd Prillerman.
Wisconsin	College of Agriculture of the University of Wisconsin.	Madison	H. L. Russell.[a]
Wyoming	College of Agriculture and Mechanic Arts of the University of Wyoming.	Laramie	C. O. Merica.

[a] Dean. [b] Acting president.

AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES, THEIR LOCATIONS AND DIRECTORS.

Alabama (College), Auburn: J. F. Duggar.
Alabama (Canebrake), Uniontown: F. D. Stevens.
Alabama (Tuskegee), Tuskegee Institute: G. W. Carver.
Alaska, Sitka (Rampart, Kodiak, and Fairbanks): C. C. Georgeson.[a]
Arizona, Tucson: R. H. Forbes.
Arkansas, Fayetteville: C. F. Adams.
California, Berkeley: E. J. Wickson.
Colorado, Fort Collins: L. G. Carpenter.
Connecticut (State), New Haven: E. H. Jenkins.
Connecticut (Storrs), Storrs: L. A. Clinton.
Delaware, Newark: Harry Hayward.
Florida, Gainesville: P. H. Rolfs.
Georgia, Experiment: M. V. Calvin.
Guam:[b] J. B. Thompson.[a]
Hawaii (Federal), Honolulu: E. V. Wilcox.[a]
Hawaii (Sugar Planters'), Honolulu: C. F. Eckart.
Idaho, Moscow: W. L. Carlyle.
Illinois, Urbana: E. Davenport.
Indiana, Lafayette: Arthur Goss.
Iowa, Ames: C. F. Curtiss.
Kansas, Manhattan: E. H. Webster.
Kentucky, Lexington: M. A. Scovell.
Louisiana (Sugar), New Orleans: W. R. Dodson.
Louisiana (State), Baton Rouge: W. R. Dodson.
Louisiana (North), Calhoun: W. R. Dodson.
Louisiana (Rice), Crowley: W. R. Dodson.
Maine, Orono: C. D. Woods.
Maryland, College Park: H. J. Patterson.
Massachusetts, Amherst: W. P. Brooks.
Michigan, East Lansing: R. S. Shaw.
Minnesota, University Farm, St. Paul: A. F. Woods.
Mississippi, Agricultural College: W. L. Hutchinson.
Missouri (College), Columbia: F. B. Mumford.
Missouri (Fruit), Mountain Grove: Paul Evans.
Montana, Bozeman: F. B. Linfield.
Nebraska, Lincoln: E. A. Burnett.
Nevada, Reno: J. E. Stubbs.
New Hampshire, Durham: W. D. Gibbs.[c]
New Jersey (State), New Brunswick: E. B. Voorhees.
New Jersey (College), New Brunswick: E. B. Voorhees.
New Mexico, Agricultural College: Luther Foster.
New York (State), Geneva: W. H. Jordan.
New York (Cornell), Ithaca: H. J. Webber.[c]
North Carolina (College), West Raleigh: C. B. Williams.
North Carolina (State), Raleigh: B. W. Kilgore.
North Dakota, Agricultural College: J. H. Worst.
Ohio, Wooster: C. E. Thorne.
Oklahoma, Stillwater: John A. Craig
Oregon, Corvallis: J. Withycombe.
Pennsylvania, State College: T. F. Hunt.
Pennsylvania (Institute of Animal Nutrition), State College: H. P. Armsby.
Porto Rico, Mayaguez: D. W. May.[a]
Rhode Island, Kingston: H. J. Wheeler.
South Carolina, Clemson College: J. N. Harper.
South Dakota, Brookings: J. W. Wilson.
Tennessee, Knoxville: H. A. Morgan.
Texas, College Station: H. H. Harrington.
Utah, Logan: E. D. Ball.
Vermont, Burlington: J. L. Hills.
Virginia (College), Blacksburg: S. W. Fletcher.
Virginia (Truck), Norfolk: T. C. Johnson.
Washington, Pullman: R. W. Thatcher.
West Virginia, Morgantown: J. H. Stewart.
Wisconsin, Madison: H. L. Russell
Wyoming, Laramie: J. D. Towar

[a] Special agent in charge. [b] Address: Island of Guam, via San Francisco. [c] Acting director.

STATE OFFICIALS IN CHARGE OF AGRICULTURE.[a]

Commissioners of Agriculture.[b]

State or Territory.	Name of official.	Post-office.
Alabama	J. A. Wilkinson	Montgomery.
Arkansas	Guy B. Tucker	Little Rock.
Florida	B. E. McLin	Tallahassee.
Georgia	T. G. Hudson	Atlanta.
Idaho	Joseph P. Fallon, commissioner of immigration, etc	Boise.
Kentucky	M. C. Rankin	Frankfort.
Louisiana	Charles Schuler	Baton Rouge.
Maine	A. W. Gilman	Augusta.
Maryland	W. Frank Hines, superintendent of immigration	Baltimore.
Mississippi	H. E. Blakeslee	Jackson.
Montana	Jno. H. Hall	Helena.
New Mexico	Nathan Jaffa, secretary of state	Santa Fe.
New York	Raymond A. Pearson	Albany.
North Carolina	W. A. Graham	Raleigh.
North Dakota	W. C. Gilbreath	Bismarck.
Pennsylvania	N. B. Critchfield, secretary of agriculture	Harrisburg.
Philippine Islands	G. E. Nesom, director of agriculture	Manila.
Porto Rico	D. W. May, director of experiment station	Mayaguez.
South Carolina	E. J. Watson	Columbia.
Tennessee	John Thompson	Nashville.
Texas	Ed. R. Kone	Austin.
Utah	J. A. Widtsoe, president agricultural college	Logan.
Vermont	O. L. Martin	Plainfield.
Virginia	Geo. W. Koiner	Richmond.
Washington	I. M. Howell, secretary of state	Olympia.

[a] Officials of Territories and island dependencies are included. So far as learned, Alaska, Arizona, and New Mexico have no state officials charged with agricultural interests, but letters addressed to the secretary of state will receive attention.
[b] Some of these officials have not the title of commissioner, but those given with their names.

Secretaries of State Boards of Agriculture.

State or Territory.	Name of official.	Post-office.
California	J. A. Filcher	Sacramento.
Colorado	Lathrop M. Taylor	Fort Collins.
Connecticut	J. F. Brown	North Stonington.
Delaware	Wesley Webb	Dover.
Hawaii	Marston Campbell	Honolulu.
Illinois	J. K. Dickirson	Springfield.
Indiana	Chas. Downing	Indianapolis.
Iowa	J. C. Simpson	Des Moines.
Kansas	F. D. Coburn	Topeka.
Kentucky	Perry M. Shy	Frankfort.
Louisiana	Eugene Jastremski	Baton Rouge.
Maryland	A. F. Trappe	Baltimore.
Massachusetts	J. L. Ellsworth	Boston.
Michigan	Addison M. Brown	East Lansing.
Minnesota	C. N. Cosgrove, secretary state agricultural society	St. Paul.
Missouri	T. C. Wilson	Columbia.
Nebraska	W. R. Mellor	Lincoln.
Nevada	Louis Bevier	Carson City.
New Hampshire	N. J. Bachelder	Concord.
New Jersey	Franklin Dye	Trenton.
North Carolina	Elias Carr	Raleigh.
Ohio	A. P. Sandles	Columbus.
Oklahoma	Chas. F. Barrett	Guthrie.
Oregon	Frank Meredith	Salem.
Rhode Island	John J. Dunn	Providence.
South Dakota	C. N. McIlvaine	Huron.
West Virginia	John M. Millan	Charleston.
Wisconsin	John M. True	Madison.
Wyoming	J. D. Towar	Laramie.

STATISTICS OF THE PRINCIPAL CROPS.

[Figures furnished by the Bureau of Statistics, Department of Agriculture, except where otherwise stated. All prices on gold basis.]

CORN.

Corn area of countries named, 1904–1908.

Country.	1904.	1905.	1906.	1907.	1908.
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
United States	92,231,600	94,011,400	96,737,600	99,931,000	101,788,000
Canada:					
Ontario	329,900	295,000	289,500	338,600	332,200
Quebec	(a)	(a)	(a)	35,800	33,600
Mexico	(a)	(a)	(a)	(a)	(a)
SOUTH AMERICA.					
Argentina	5,206,000	5,651,400	6,714,600	7,045,700	6,719,400
Chile	(a)	(a)	(a)	(a)	63,100
Uruguay	(a)	437,100	411,100	524,200	(a)
EUROPE.					
Austria-Hungary:					
Austria	836,200	861,100	847,500	860,800	845,100
Hungary proper	4,852,100	5,247,000	5,714,300	6,031,600	5,831,100
Croatia-Slavonia	976,200	988,400	1,004,800	988,100	1,033,300
Bosnia-Herzegovina	(a)	(a)	711,300	777,900	702,900
Total Austria-Hungary			8,277,900	8,658,400	8,412,400
Bulgaria	1,201,700	1,168,400	1,254,400	1,231,300	1,410,400
France	1,224,600	1,241,400	1,154,900	1,236,500	(a)
Italy	4,796,800	4,843,800	4,491,000	4,483,500	4,444,700
Portugal	(a)	(a)	(a)	(a)	(a)
Roumania	5,164,800	4,882,200	5,144,500	4,765,600	4,092,300
Russia:					
Russia proper	2,901,300	2,870,400	2,573,300	2,899,300	2,970,900
Poland	1,100	(a)	(a)	(a)	(a)
Northern Caucasia	630,900	630,900	630,000	571,300	659,400
Total Russia (European)	3,533,300	b 3,501,300	b 3,203,300	b 3,470,600	b 3,630,300
Servia	(a)	(a)	(a)	1,358,400	1,392,600
Spain	1,072,600	1,148,900	1,103,000	1,109,500	1,133,300
AFRICA.					
Algeria	29,300	32,700	37,500	39,000	(a)
Cape of Good Hope	(a)	(a)	(a)	(a)	(a)
Egypt	1,952,500	1,916,200	1,946,100	1,978,100	1,978,600
Natal	387,300	395,200	374,600	240,300	139,400
Sudan (Anglo-Egyptian)	(a)	(a)	(a)	(a)	(a)
AUSTRALASIA.					
Australia:					
Queensland	133,100	119,200	113,700	139,800	127,100
New South Wales	220,800	193,600	189,400	174,100	161,000
Victoria	11,800	11,400	11,800	11,600	10,900
Western Australia	100	(a)	100	100	200
New Zealand	12,900	11,900	13,100	10,700	8,600
Total Australasia	384,700	336,100	328,100	336,300	308,000

a No official statistics of area; estimates of production on p. 434.
b Exclusive of Poland.

CORN—Continued.

Corn crop of countries named, 1904-1908.

Country.	1904.	1905.	1906.	1907.	1908.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	2,467,481,000	2,707,994,000	2,927,416,000	2,592,320,000	2,668,651,000
Canada:					
Ontario	20,242,000	20,923,000	23,989,000	21,899,000	21,742,000
Quebec	.....	.....	.....	1,377,000	1,126,000
Mexico	88,131,000	83,363,000	70,000,000	70,000,000	70,000,000
Total	2,575,854,000	2,812,280,000	3,021,405,000	2,685,596,000	2,761,519,000
SOUTH AMERICA.					
Argentina	175,189,000	140,708,000	194,912,000	71,768,000	136,057,000
Chile	1,477,000	1,244,000	846,000	1,500,000	1,344,000
Uruguay	3,035,000	4,417,000	3,226,000	5,359,000	6,000,000
Total	179,701,000	146,369,000	198,984,000	78,627,000	143,401,000
EUROPE.					
Austria-Hungary:					
Austria	12,529,000	17,293,000	18,177,000	16,599,000	15,170,000
Hungary proper	59,400,000	94,045,000	162,925,000	155,619,000	146,124,000
Croatia-Slavonia	11,364,000	18,385,000	20,470,000	17,934,000	20,536,000
Bosnia-Herzegovina	6,464,000	9,584,000	8,900,000	6,468,000	8,821,000
Total Austria-Hungary	89,757,000	139,307,000	210,472,000	196,620,000	190,651,000
Bulgaria	12,758,000	18,141,000	27,780,000	14,080,000	20,717,000
France	19,482,000	24,030,000	14,581,000	24,027,000	24,000,000
Italy	90,546,000	97,266,000	93,007,000	88,513,000	95,953,000
Portugal	15,000,000	15,000,000	15,000,000	15,000,000	15,000,000
Roumania	19,598,000	59,275,000	130,546,000	57,576,000	78,892,000
Russia:					
Russia proper	18,956,000	22,533,000	59,320,000	41,903,000	49,663,000
Poland	13,000	.....	.....	1,000	.....
Northern Caucasia	6,951,000	10,798,000	11,181,000	8,860,000	11,449,000
Total Russia (European)	25,920,000	33,331,000	70,501,000	50,764,000	61,112,000
Servia	9,498,000	21,431,000	27,786,000	17,691,000	21,010,000
Spain	21,255,000	31,880,000	18,714,000	25,372,000	20,115,000
Total	303,814,000	439,661,000	608,387,000	489,643,000	527,450,000
AFRICA.					
Algeria	391,000	490,000	544,000	402,000	400,000
Cape of Good Hope	3,502,000	2,500,000	3,200,000	3,550,000	1,758,000
Egypt	30,000,000	30,000,000	30,000,000	35,000,000	30,000,000
Natal	5,282,000	4,822,000	3,845,000	2,984,000	4,593,000
Sudan (Anglo-Egyptian)	189,000	320,000	300,000	300,000	300,000
Total	39,364,000	38,132,000	37,889,000	42,236,000	37,051,000
AUSTRALASIA.					
Australia:					
Queensland	1,984,000	2,623,000	2,233,000	3,820,000	3,191,000
New South Wales	7,052,000	5,107,000	5,714,000	5,945,000	4,671,000
Victoria	933,000	643,000	661,000	727,000	525,000
Western Australia	3,000	1,000	1,000	1,000	1,000
Total Australia	9,972,000	8,374,000	8,609,000	10,493,000	8,388,000
New Zealand	547,000	506,000	653,000	419,000	[a]519,000
Total Australasia	10,519,000	8,880,000	9,262,000	10,912,000	8,907,000
Grand total	3,109,252,000	3,445,322,000	3,875,927,000	3,307,014,000	3,478,328,000

CORN—Continued.

Acreage, production, value, prices, and exports of corn in the United States, 1849–1909.

Year.	Acreage.	Average yield per acre.	Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.	Chicago cash price per bushel, No. 2. December. Low.	Chicago cash price per bushel, No. 2. December. High.	Chicago cash price per bushel, No. 2. May of following year. Low.	Chicago cash price per bushel, No. 2. May of following year. High.	Domestic exports, including corn meal, fiscal year beginning July 1.	Per cent of crop exported.
	Acres.	*Bush.*	*Bushels.*	*Cents.*	*Dollars.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Bushels.*	*P. ct.*
1849 a.	....	......	592,071,000	......	....	....	....	....	....	7,632,860	1.3
1859 a.	....	......	838,793,000	......	....	....	....	....	....	4,248,991	.5
1866..	34,307,000	25.3	867,946,000	47.4	411,451,000	53	62	64	79	16,026,947	1.8
1867..	32,520,000	23.6	768,320,000	57.0	437,770,000	61	65	61	71	12,493,522	1.6
1868..	34,887,000	26.0	906,527,000	46.8	424,057,000	38	58	44	51	8,286,665	.9
1869..	37,103,000	23.6	874,320,000	59.8	522,551,000	56	67	73	85	2,140,487	.2
1870..	38,647,000	28.3	1,094,255,000	49.4	540,520,000	41	59	46	52	10,673,553	1.0
1871..	34,091,000	29.1	991,898,000	43.4	430,356,000	36	39	38	43	35,727,010	3.6
1872..	35,527,000	30.8	1,092,719,000	35.3	385,736,000	27	28	34	39	40,154,374	3.7
1873..	39,197,000	23.8	932,274,000	44.2	411,961,000	40	49	49	59	35,985,834	3.9
1874..	41,037,000	20.7	850,148,000	58.4	496,271,000	64	76	53	67	30,025,036	3.5
1875..	44,841,000	29.5	1,321,069,000	36.7	484,675,000	40	47	41	45	50,910,532	3.9
1876..	49,033,000	26.2	1,283,828,000	34.0	436,109,000	40	43	43	56	72,652,611	5.7
1877..	50,369,000	26.7	1,342,558,000	34.8	467,635,000	41	49	35	41	87,192,110	6.5
1878..	51,585,000	26.9	1,388,219,000	31.7	440,281,000	30	32	33	36	87,884,892	6.3
1879..	53,085,000	29.2	1,547,902,000	37.5	580,486,000	39	43½	32⅞	36⅛	99,572,329	6.4
1880..	62,318,000	27.6	1,717,435,000	39.6	679,714,000	35⅝	42	41½	45	93,648,147	5.5
1881..	64,262,000	18.6	1,194,916,000	63.6	759,482,000	58¼	63½	69	76⅛	44,340,683	3.7
1882..	65,660,000	24.6	1,617,025,000	48.5	783,867,000	49¼	61	53¼	56¾	41,655,653	2.6
1883..	68,302,000	22.7	1,551,067,000	42.4	658,051,000	54½	63½	52½	57	46,258,606	3.0
1884..	69,684,000	25.8	1,795,528,000	35.7	640,736,000	34½	40¼	44¾	49	52,876,456	2.9
1885..	73,130,000	26.5	1,936,176,000	32.8	635,675,000	36	42¾	34¼	30¾	64,829,617	3.3
1886..	75,694,000	22.0	1,665,441,000	36.6	610,311,000	35¼	38	36⅞	39⅜	41,368,584	2.5
1887..	72,393,000	20.1	1,456,161,000	44.4	646,107,000	47	51½	54	60	25,360,869	1.7
1888..	75,673,000	26.3	1,987,790,000	34.1	677,562,000	33½	35⅛	33⅛	35⅝	70,841,673	3.6
1889..	78,320,000	27.0	2,112,892,000	28.3	597,919,000	29¼	35	32¾	35	103,418,709	4.9
1890..	71,971,000	20.7	1,489,970,000	50.6	754,433,000	47¾	53	55	69½	32,041,529	2.2
1891..	76,205,000	27.0	2,060,154,000	40.6	836,439,000	39⅜	59	40¾	b100	76,602,285	3.7
1892..	70,627,000	23.1	1,628,464,000	39.4	642,147,000	40	42⅞	39¼	44½	47,121,894	2.9
1893..	72,036,000	22.5	1,619,496,000	36.5	591,626,000	34¼	36¼	36¾	38½	66,489,529	4.1
1894..	62,582,000	19.4	1,212,770,000	45.7	554,719,000	44¾	47¼	47¾	55½	28,585,405	2.4
1895..	82,076,000	26.2	2,151,139,000	25.3	544,986,000	25	26¾	27½	29½	101,100,375	4.7
1896..	81,027,000	28.2	2,283,875,000	21.5	491,007,000	22½	23¾	23	25½	178,817,417	7.8
1897..	80,095,000	23.8	1,902,968,000	26.3	501,073,000	25	27½	32⅜	37	212,055,543	11.1
1898..	77,722,000	24.8	1,924,185,000	28.7	552,023,000	33⅛	38	32½	34⅜	177,255,046	9.2
1899..	82,109,000	25.3	2,078,144,000	30.3	629,210,000	30	31½	36	40½	213,123,412	10.3
1900..	83,321,000	25.3	2,105,103,000	35.7	751,220,000	35¼	40½	42⅝	58½	181,405,473	8.6
1901..	91,350,000	16.7	1,522,520,000	60.5	921,556,000	62¼	67½	59⅛	64¾	28,028,688	1.8
1902..	94,044,000	26.8	2,523,648,000	40.3	1,017,017,000	43¾	57¼	44	46	76,639,261	3.0
1903..	88,092,000	25.5	2,244,177,000	42.5	952,869,000	41	43¾	47¼	50	58,222,061	2.6
1904..	92,232,000	26.8	2,467,481,000	44.1	1,087,461,000	43½	49	48	64½	90,293,483	3.7
1905..	94,011,000	28.8	2,707,994,000	41.2	1,116,697,000	42	50¼	47½	50	119,893,833	4.4
1906..	96,738,000	30.3	2,927,416,000	39.9	1,166,626,000	40	46	49½	56	86,368,228	3.0
1907..	99,931,000	25.9	2,592,320,000	51.6	1,336,901,000	57½	61½	67¾	82	55,063,860	2.1
1908..	101,788,000	26.2	2,668,651,000	60.6	1,616,145,000	56¾	62¼	72	76	37,665,040	1.4
1909..	108,771,000	25.5	2,772,376,000	59.6	1,652,822,000	62½	66	....	....	....	.....

a Census figures of production.

b Coincident with "corner."

CORN—Continued.

Condition of the corn crop in the United States on the first of months named, 1889–1909.

Year.	July.	Aug.	Sept.	Oct.	Year.	July.	Aug.	Sept.	Oct.	Year.	July.	Aug.	Sept.	Oct.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1889....	90.3	94.8	90.9	91.7	1896....	92.4	96.0	91.0	90.5	1903....	79.4	78.7	80.1	80.8
1890....	93.1	73.3	70.1	70.6	1897....	82.9	84.2	79.3	77.1	1904....	86.4	87.3	84.6	83.9
1891....	92.8	90.8	91.1	92.5	1898....	90.5	87.0	84.1	82.0	1905....	87.3	89.0	89.5	89.2
1892....	81.1	82.5	79.6	79.8	1899....	86.5	89.9	85.2	82.7	1906....	87.5	88.0	90.2	90.1
1893....	93.2	87.0	76.7	75.1	1900....	89.5	87.5	80.6	78.2	1907....	80.2	82.8	80.2	78.0
1894....	95.0	69.1	63.4	64.2	1901....	81.3	54.0	51.7	52.1	1908....	82.8	82.5	79.4	77.8
1895....	99.3	102.5	96.4	95.5	1902....	87.5	86.5	84.3	79.6	1909....	89.3	84.4	74.6	73.8

Average farm price of corn per bushel, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January........	60.7	54.0	72.3	70.0	78.5	73.0	59.2	49.8	53.1	47.3	64.8	60.1	79.7	73.0
February......	61.4	......	71.2	......	78.9	......	59.6	......	53.5	......	66.4	......	78.7	......
March..........	64.7	58.1	74.2	68.4	82.1	76.4	63.0	52.4	56.4	51.4	70.2	66.8	84.7	69.2
April...........	67.5	61.2	75.6	72.0	85.3	78.8	65.0	58.4	58.8	54.7	74.7	66.5	88.7	76.8
May............	71.9	64.7	78.1	73.2	89.7	83.1	68.4	61.4	63.7	58.3	79.4	70.1	94.7	76.8
June...........	76.3	73.7	81.5	77.6	94.3	91.8	73.1	69.3	67.8	64.0	84.2	80.0	95.1	83.6
July............	77.0	75.7	84.4	79.4	97.4	94.6	73.4	70.5	67.6	65.8	85.4	82.6	99.9	85.0
August.........	75.2	78.1	83.2	82.2	96.3	95.9	72.8	74.1	65.5	69.5	82.3	83.2	94.6	83.6
September....	71.0	76.5	79.0	83.5	93.5	95.3	69.4	75.7	61.4	69.4	76.6	76.6	85.7	81.2
October........	67.1	72.3	81.0	82.8	87.8	92.7	64.5	74.3	58.4	65.3	72.3	68.9	85.7	83.5
November....	62.2	63.5	73.7	75.7	82.5	84.1	55.9	60.7	54.1	55.4	70.8	64.9	84.9	81.2
December.....	59.6	60.6	71.8	74.9	80.3	77.1	53.5	59.7	52.3	53.4	69.2	63.3	82.3	79.2

CORN—Continued.

Acreage, production, value, and distribution of corn in the United States in 1909, by States.

[Quantity expressed in bushels, 000 omitted.]

State, Territory, or Division.	Crop of 1909.			Farm reserves of preceding year's growth Nov. 1—			Farm reserves Mar 1—			Shipped out of county where grown.		
	Acreage.	Production.	Farm value Dec. 1.	1909.		10-year average.	1910.		10-year average.	1910.		10-year average.
	Acres.	*Bush.*	*Dollars*	*Bu.*	*P.c.*	*P.c.*	*Bush.*	*P.c.*	*P.c.*	*Bush.*	*P.c.*	*P.c.*
Maine	17,000	646	517,000	8	1.5	1.1	129	20	21	0	0	0
New Hampshire	30,000	1,053	800,000	16	1.5	1.3	242	23	27	0	0	0
Vermont	65,000	2,405	1,756,000	50	2.0	1.9	697	29	29	0	0	0
Massachusetts	47,000	1,786	1,447,000	64	3.5	1.8	572	32	28	0	0	0
Rhode Island	11,000	365	354,000	14	3.3	3.5	135	37	36	0	0	1
Connecticut	60,000	2,460	1,845,000	29	1.2	1.1	738	30	31	0	0	1
New York	670,000	24,120	17,849,000	364	1.5	2.3	6,995	29	30	724	3	2
New Jersey	290,000	9,483	6,733,000	359	3.4	4.2	3,888	41	41	1,707	18	13
Pennsylvania	1,525,000	48,800	34,160,000	1,068	1.9	3.9	14,152	29	38	1,464	3	6
North Atlantic	2,715,000	91,118	65,461,000	1,992	2.0	3.4	27,548	30.2	35.7	3,895	4.3	5.3
Delaware	200,000	6,200	3,596,000	81	1.3	2.7	2,294	37	47	2,356	38	37
Maryland	700,000	21,980	14,287,000	494	2.0	2.7	7,693	35	42	5,935	27	30
Virginia	2,040,000	47,328	35,023,000	1,101	2.2	3.6	18,931	40	43	4,733	10	10
West Virginia	880,000	27,632	20,448,000	599	2.5	4.1	8,842	32	34	1,382	5	6
N. Carolina	2,898,000	48,686	41,383,000	1,304	2.6	3.0	21,909	45	44	1,947	4	4
S. Carolina	2,218,000	37,041	33,337,000	965	3.3	2.8	18,150	49	44	1,482	4	3
Georgia	4,400,000	61,160	52,598,000	752	1.4	2.4	25,687	42	47	1,223	2	4
Florida	665,000	8,379	6,955,000	33	.5	1.4	3,016	36	40	251	3	3
South Atlantic	14,001,000	258,406	207,627,000	5,329	2.2	3.0	106,522	41.2	43.2	19,309	7.5	8.8
Ohio	3,875,000	153,062	85,715,000	3,827	2.8	4.6	61,225	40	36	41,327	27	22
Indiana	4,913,000	196,520	98,260,000	4,411	3.2	5.0	76,643	39	39	72,712	37	29
Illinois	10,300,000	369,770	192,280,000	10,452	3.5	4.4	155,303	42	41	177,400	48	40
Michigan	1,976,000	69,950	42,670,000	1,692	2.8	3.6	23,084	33	34	4,197	6	7
Wisconsin	1,533,000	50,589	30,353,000	1,391	2.8	4.5	16,694	33	31	1,518	3	5
N. C. E. Miss. R.	22,597,000	839,891	449,278,000	21,773	3.2	4.5	332,949	39.6	38.4	297,244	35.4	29.2
Minnesota	1,690,000	58,812	28,818,000	1,171	2.5	3.6	21,172	36	32	13,527	23	11
Iowa	9,200,000	289,800	142,002,000	12,935	4.5	3.4	121,716	42	39	81,144	28	18
Missouri	8,100,000	213,840	126,166,000	7,331	3.6	4.8	76,982	36	37	27,799	13	12
North Dakota	195,000	6,045	3,325,000	8	.2	.6	1,390	23	21	302	5	2
South Dakota	2,059,000	65,270	32,635,000	1,269	2.2	2.9	25,455	39	35	24,150	37	22
Nebraska	7,825,000	194,060	97,030,000	9,259	4.5	4.5	85,386	44	39	71,802	37	38
Kansas	7,750,000	154,225	83,282,000	4,998	3.2	4.8	53,979	35	33	33,930	22	21
N. C. W. Miss. R.	36,819,000	982,052	513,258,000	36,971	3.8	4.1	386,080	39.3	37.0	252,654	25.7	21.0
Kentucky	3,568,000	103,472	64,153,000	2,799	3.3	4.8	39,319	38	40	12,417	12	10
Tennessee	3,575,000	78,650	55,055,000	2,659	3.2	3.3	29,100	37	40	11,011	14	14
Alabama	3,233,000	43,646	37,099,000	672	1.5	2.2	16,585	38	44	1,309	3	3
Mississippi	2,810,000	40,745	33,003,000	733	1.6	2.4	13,446	33	41	815	2	2
Louisiana	2,226,000	51,198	35,327,000	678	2.0	1.5	18,943	37	33	10,240	20	2
Texas	8,150,000	122,250	92,910,000	3,028	1.5	3.2	29,340	24	32	8,558	7	9
Oklahoma	5,950,000	101,150	55,632,000	1,834	1.5	3.2	32,368	32	32	20,230	20	21
Arkansas	2,800,000	50,400	36,288,000	1,243	2.3	3.5	16,632	33	38	1,512	3	4
South Central	32,312,000	591,511	409,467,000	13,646	2.0	3.3	195,733	33.1	36.3	66,092	11.2	10.7
Montana	5,000	175	150,000	0	0.0	.6	44	25	15	9	5	1
Wyoming	5,000	140	109,000	0	0.0	.5	28	20	17	1	1	0
Colorado	135,000	3,267	2,287,000	41	1.6	1.9	1,045	32	24	392	12	6
New Mexico	68,000	2,128	1,915,000	11	.6	.7	447	21	21	149	7	5
Arizona	13,000	417	417,000	2	.4	.1	63	15	17	58	14	5
Utah	13,000	406	355,000	2	.5	.5	86	21	17	41	10	2
Idaho	6,000	184	138,000	0	.3	.6	22	12	16	6	3	3
Washington	15,000	417	359,000	0	.1	.8	67	16	16	17	4	3
Oregon	17,000	522	418,000	2	.4	.9	57	11	13	16	3	2
California	50,000	1,740	1,583,000	10	.6	2.0	174	10	16	522	30	12
Far Western	327,000	9,396	7,731,000	68	.9	1.5	2,033	21.6	19.7	1,211	12.9	6.6
United States	108,771,000	2,772,376	1,652,822,000	79,779	3.0	4.1	1,050,865	37.9	38.2	640,405	23.1	20.0

CORN—*Continued.*

Average yield per acre of corn in the United States.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866-1875.	1876-1885.	1886-1895.	1896-1905.										
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	29.3	33.8	34.3	35.1	36.0	39.4	21.7	30.2	39.7	34.3	37.0	37.0	40.5	38.0
New Hampshire	35.5	35.5	34.5	34.0	37.0	38.5	23.3	21.0	27.3	37.0	37.5	85.0	39.0	85.1
Vermont	36.0	35.3	35.5	35.1	40.0	40.0	21.8	23.4	35.9	34.7	35.5	36.0	40.3	37.0
Massachusetts	34.6	32.5	35.7	35.9	38.0	40.5	31.3	24.0	36.0	37.5	39.7	36.0	40.4	38.0
Rhode Island	26.9	30.8	31.2	31.9	32.0	32.1	28.4	30.1	34.1	32.5	33.1	31.2	42.8	33.2
Connecticut	30.9	29.1	33.4	35.8	38.0	39.0	31.5	22.4	38.9	42.7	40.0	33.0	41.3	41.0
New York	31.6	30.4	31.1	30.3	32.0	33.0	25.0	25.0	27.3	31.5	34.9	27.0	38.8	36.0
New Jersey	36.5	32.8	30.9	34.3	33.0	36.9	34.5	24.0	38.0	35.8	36.3	31.5	38.0	32.7
Pennsylvania	35.1	32.6	30.4	34.5	25.0	35.0	36.1	31.2	34.0	38.9	40.2	32.5	39.5	32.0
North Atlantic	34.2	32.0	30.9	33.5	28.6	35.0	32.5	28.3	32.9	36.7	38.3	31.3	39.3	33.6
Delaware	20.5	22.5	19.8	26.8	24.0	30.0	28.0	27.5	30.4	30.4	30.0	27.5	32.0	31.0
Maryland	24.7	26.0	23.5	32.0	26.0	34.2	32.4	28.7	33.4	30.9	35.0	34.2	36.6	31.4
Virginia	20.0	17.9	17.4	21.0	16.0	22.2	22.0	21.8	23.3	23.4	24.3	25.0	26.0	23.2
West Virginia	29.3	25.8	22.2	26.4	27.0	23.0	26.5	22.6	25.3	29.8	30.3	28.0	31.2	31.4
North Carolina	14.3	13.3	12.4	13.4	12.0	12.0	13.9	14.7	15.2	13.9	15.3	16.5	18.0	16.8
South Carolina	9.7	8.8	10.2	9.5	7.0	6.9	10.4	10.3	12.4	10.9	12.2	15.1	14.1	16.7
Georgia	11.3	10.3	11.2	10.5	10.0	10.0	9.0	11.7	11.9	11.0	12.0	13.0	12.5	13.9
Florida	10.9	9.5	10.2	9.3	8.0	9.0	8.6	9.9	10.7	10.1	11.0	11.3	10.5	12.6
South Atlantic	17.4	14.4	13.9	15.0	12.9	14.2	14.7	15.3	16.5	16.0	16.9	17.8	18.3	18.5
Ohio	35.3	32.6	28.8	34.8	37.0	26.1	38.0	29.6	32.5	37.8	42.6	34.6	38.5	39.5
Indiana	32.3	29.9	28.9	34.0	38.0	19.8	37.9	33.2	31.5	40.7	39.6	36.0	30.3	40.0
Illinois	29.9	27.2	29.0	34.5	37.0	21.4	38.7	32.2	36.5	39.8	36.1	36.0	31.6	35.9
Michigan	32.2	31.8	26.7	32.2	36.0	34.5	26.4	33.5	28.6	34.0	37.0	30.1	31.8	35.4
Wisconsin	31.4	30.4	27.4	33.2	40.0	27.4	28.2	29.3	29.7	37.6	41.2	32.0	33.7	33.0
N. Central E. of Mississippi River	31.9	29.2	28.7	34.2	37.4	23.1	36.8	31.9	33.7	39.2	38.4	35.0	32.7	37.2
Minnesota	32.2	30.9	27.6	29.1	33.0	26.3	22.8	28.3	26.9	32.5	33.6	27.0	29.0	34.8
Iowa	34.3	31.8	30.1	32.4	38.0	25.0	32.0	28.0	32.6	34.8	39.5	29.5	31.7	31.5
Missouri	30.1	28.6	27.7	27.4	28.0	10.1	39.0	32.4	26.2	33.8	32.3	31.0	27.0	26.4
North Dakota	.....	.....	20.1	22.6	16.0	22.6	19.4	25.2	21.2	27.5	27.8	20.0	23.8	31.0
South Dakota	.....	.....	16.8	25.8	27.0	21.0	18.9	27.2	28.1	31.8	33.5	25.5	29.7	31.7
Nebraska	32.5	35.5	25.2	28.0	26.0	14.1	32.3	26.0	32.8	32.8	34.1	24.0	27.0	24.8
Kansas	33.5	33.4	22.2	22.0	19.0	7.8	29.9	25.6	20.9	27.7	28.9	22.1	22.0	19.9
N. Central W. of Mississippi River	32.4	31.4	26.1	27.7	27.7	15.6	32.0	27.9	28.7	32.4	34.1	26.8	27.4	26.7
Kentucky	29.3	26.0	24.9	25.5	26.0	15.6	27.0	26.6	26.9	29.7	33.0	28.2	25.2	29.0
Tennessee	22.9	21.4	21.5	21.9	20.0	14.2	21.9	23.5	25.0	24.6	28.1	26.0	24.8	22.0
Alabama	14.0	12.4	12.8	12.6	11.0	10.9	8.4	14.8	15.0	14.8	16.0	15.5	14.7	13.5
Mississippi	16.0	14.2	14.7	14.7	11.0	10.9	11.5	18.4	19.1	14.3	18.5	17.0	17.3	14.5
Louisiana	18.2	16.3	16.2	16.3	17.0	13.7	12.5	20.6	19.9	13.7	17.2	17.5	19.8	23.0
Texas	23.7	19.8	19.0	17.7	18.0	11.6	8.1	24.2	22.6	21.3	22.5	21.0	25.7	15.0
Oklahoma	.....	.....	.....	23.5	26.0	9.5	25.4	25.5	30.2	26.4	33.3	24.4	24.8	17.0
Arkansas	25.7	21.4	19.2	17.8	19.0	8.1	21.3	20.9	21.6	17.3	23.6	17.2	20.2	18.0
South Central	23.4	19.7	19.1	18.9	17.9	11.9	16.8	22.4	23.1	21.8	24.8	21.5	22.7	18.3
Montana	.....	26.6	26.1	22.3	15.0	25.0	22.0	24.1	22.2	19.4	23.4	22.5	23.4	35.0
Wyoming	.....	.....	23.6	24.7	34.0	39.5	19.8	19.4	32.5	26.9	27.0	25.0	28.0	28.0
Colorado	.....	25.3	22.8	18.7	19.0	17.1	16.5	19.8	20.5	23.8	27.9	23.5	20.2	24.2
New Mexico	.....	20.4	20.7	23.2	22.0	31.6	22.0	24.0	22.7	25.3	29.4	29.0	27.0	31.3
Arizona	.....	21.1	20.2	22.3	21.0	18.0	20.2	22.4	23.8	27.0	29.5	37.5	33.2	32.1
Utah	.....	23.3	19.9	23.8	20.0	19.4	20.1	21.4	33.2	36.2	32.0	25.5	29.4	31.4
Idaho	.....	22.5	24.2	27.7	38.0	23.0	24.7	34.5	29.3	27.2	28.3	30.0	29.0	30.6
Washington	.....	26.4	20.7	20.0	20.0	17.5	23.0	23.1	24.7	24.2	25.2	27.0	25.5	27.8
Oregon	29.5	26.3	24.3	23.8	23.0	20.8	23.4	25.8	28.8	23.0	27.6	27.5	27.8	30.7
California	28.6	29.2	29.6	29.9	25.0	31.0	30.5	30.7	28.6	32.0	34.9	34.0	32.0	34.8
Far Western	28.7	25.6	24.3	23.1	20.8	23.1	21.6	23.8	24.1	26.3	29.6	27.5	25.3	28.7
United States	26.1	25.5	23.4	25.2	25.3	16.7	26.8	25.5	26.8	28.8	30.3	25.9	26.2	25.5

CORN—Continued.

Average farm value per acre of corn in the United States December 1.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Dolls.	*Dolls.*	*Dolls*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls*	*Dolls*	*Dolls*	*Dolls.*
Maine	29.89	26.36	23.32	21.41	19.80	29.94	16.06	19.93	32.16	25.67	23.08	27.75	34.00	30.41
N. Hampshire	33.72	27.34	22.77	20.40	20.72	30.03	17.01	13.23	19.66	25.53	24.00	26.23	30.82	26.67
Vermont	33.84	26.12	22.72	20.01	20.00	29.20	14.82	14.51	26.21	23.60	20.05	27.00	31.44	27.02
Massachusetts	31.83	24.70	22.85	21.54	20.52	30.78	23.16	15.84	25.92	26.25	23.82	27.00	32.73	30.70
Rhode Island	26.63	24.33	21.22	21.69	21.44	24.40	22.15	24.38	28.64	23.08	21.18	25.00	38.50	32.18
Connecticut	29.66	21.53	21.38	21.84	20.90	29.25	23.31	15.01	28.40	30.32	24.00	24.75	33.03	30.75
New York	24.33	19.15	17.73	16.36	15.04	23.76	16.75	15.00	17.47	19.21	20.59	19.17	31.04	26.64
New Jersey	25.18	19.35	16.69	16.81	14.85	24.35	19.32	13.38	22.04	19.69	19.24	19.85	26.22	23.22
Pennsylvania	23.17	18.58	15.50	16.56	11.25	21.70	20.94	17.78	20.06	21.01	20.90	20.80	28.84	22.40
N. Atlantic	24.73	19.39	16.62	16.92	13.28	23.10	19.62	16.49	20.15	20.86	20.81	20.74	29.40	24.11
Delaware	11.89	11.02	8.71	10.99	9.12	17.10	13.72	13.48	14.90	14.29	12.60	14.30	18.88	17.98
Maryland	15.31	13.26	10.81	13.76	10.66	19.84	16.52	14.64	16.70	17.71	15.75	18.47	22.09	20.41
Virginia	11.40	9.13	8.18	9.87	7.84	13.10	11.44	11.55	13.75	12.40	13.37	16.00	18.46	17.17
W. Virginia	16.41	12.90	11.10	13.46	13.50	14.95	14.31	14.46	16.19	15.79	16.66	20.16	24.02	23.24
N. Carolina	9.30	7.58	6.57	7.37	6.84	8.76	8.34	8.97	9.42	8.90	10.40	12.21	14.22	14.28
S. Carolina	8.73	6.34	6.12	5.89	4.48	5.80	7.18	7.11	8.68	8.07	8.91	11.78	12.83	15.03
Georgia	9.15	7.00	6.61	6.40	5.70	8.20	6.57	8.07	8.45	7.70	8.04	9.88	10.25	11.95
Florida	12.23	7.60	6.83	6.04	4.80	7.65	6.62	7.23	8.02	6.67	6.82	9.04	8.61	10.46
S. Atlantic	11.88	8.32	7.35	8.00	6.83	9.85	8.86	9.39	10.44	9.69	10.30	12.54	14.13	14.83
Ohio	15.53	14.02	11.23	12.88	12.58	14.88	15.96	13.91	14.95	16.25	16.61	17.99	24.25	22.12
Indiana	12.27	11.36	10.40	11.22	12.16	10.89	13.64	11.95	12.91	15.47	14.26	16.20	18.18	20.00
Illinois	10.17	9.52	9.57	11.38	11.84	12.20	13.93	11.59	14.23	15.12	13.00	15.84	18.01	18.67
Michigan	17.39	14.63	11.75	13.20	13.32	17.94	13.73	15.41	14.87	15.64	16.28	16.56	20.35	21.59
Wisconsin	15.07	12.16	10.41	12.28	13.20	14.25	14.10	12.60	13.66	15.79	16.89	17.60	20.56	19.80
N. Central East of Miss. R.	12.41	11.07	10.22	11.76	12.25	12.86	14.19	12.41	14.04	15.45	14.38	16.46	19.50	19.88
Minnesota	14.81	11.43	9.38	9.02	9.57	11.83	9.12	10.75	9.68	10.72	11.42	13.50	15.95	17.05
Iowa	10.29	8.59	9.03	9.40	10.26	13.00	10.56	10.64	10.76	11.83	12.64	12.69	16.48	15.44
Missouri	12.04	9.44	9.14	9.59	8.96	6.77	12.87	11.02	11.53	12.51	12.27	14.57	15.39	15.58
N. Dakota	......	......	7.44	8.59	6.72	10.40	8.73	10.58	8.48	9.90	10.84	12.00	14.28	17.05
S. Dakota	......	......	5.38	7.74	7.83	9.45	7.75	9.52	10.12	9.86	9.72	11.73	14.85	15.85
Nebraska	11.70	8.52	7.31	7.84	8.06	7.61	9.69	7.28	10.82	10.50	9.89	9.84	13.77	12.40
Kansas	14.07	9.35	7.10	7.26	6.08	4.91	10.17	9.22	8.57	9.14	9.25	9.72	12.10	10.75
N. Central West of Miss. R.	11.66	9.07	8.09	8.56	8.29	8.53	10.54	9.63	10.39	10.91	11.08	11.89	14.65	13.94
Kentucky	12.01	10.92	9.96	10.71	10.40	9.52	11.34	14.90	13.18	12.77	13.86	14.95	16.38	17.98
Tennessee	10.76	8.99	8.82	9.64	9.80	9.23	10.29	11.52	12.50	12.30	13.21	14.82	15.87	15.40
Alabama	10.92	7.94	7.04	7.06	6.38	8.39	5.63	8.44	9.00	9.47	10.24	11.63	12.20	11.48
Mississippi	13.12	8.95	7.94	7.94	6.38	8.07	7.02	9.94	10.70	9.30	11.28	12.75	14.36	11.74
Louisiana	15.29	10.76	8.91	8.80	8.50	10.27	8.25	11.95	11.34	8.36	10.32	12.25	13.86	15.87
Texas	15.88	12.28	9.50	8.67	8.46	9.28	5.35	11.62	11.75	10.44	11.25	12.60	15.16	11.40
Oklahoma	......	......	......	9.16	6.76	7.38	10.38	9.84	11.96	10.10	10.32	10.72	12.65	9.35
Arkansas	16.96	11.34	9.02	8.54	8.17	6.56	10.44	10.66	11.45	9.51	11.09	11.70	13.33	12.90
S. Central	13.43	9.95	8.84	8.83	8.31	8.63	8.38	11.20	11.61	10.51	11.47	12.61	14.34	12.67
Montana	......	23.41	18.27	14.72	8.85	22.50	15.84	14.94	15.10	13.19	15.21	15.25	21.25	30.00
Wyoming	......	......	14.63	15.07	20.40	28.44	11.68	11.25	18.52	20.17	15.93	17.33	21.33	21.80
Colorado	......	20.75	12.31	9.16	9.12	12.65	9.73	10.69	11.07	11.19	13.95	15.27	14.34	10.94
New Mexico	......	17.34	14.28	15.54	14.08	24.33	17.16	18.00	17.71	17.46	21.17	20.88	21.60	28.16
Arizona	......	17.72	15.15	20.96	......	16.20	20.40	20.16	21.66	26.19	25.08	33.75	34.92	32.08
Utah	......	17.94	12.14	15.71	12.60	17.46	13.47	14.98	23.90	25.34	23.68	18.36	21.18	27.31
Idaho	......	19.80	15.73	17.45	......	13.80	15.31	19.67	20.51	17.95	15.85	21.00	20.33	23.00
Washington	......	20.86	12.83	11.40	11.80	10.15	14.95	12.70	16.30	14.52	13.86	18.92	19.38	23.93
Oregon	25.96	21.30	15.07	14.28	13.11	11.86	15.44	17.29	17.57	13.57	17.94	20.38	21.44	24.59
California	38.60	23.07	17.76	19.73	15.25	21.08	23.49	22.72	22.31	52.32	23.38	28.91	28.16	31.66
Far Western	**28.50**	**20.63**	**14.51**	**14.28**	**11.21**	**16.68**	**15.04**	**15.59**	**16.01**	**16.37**	**18.06**	**20.21**	**20.07**	**23.64**
United States.	**12.48**	**10.23**	**8.94**	**9.35**	**9.02**	**10.09**	**10.81**	**10.82**	**11.79**	**11.88**	**12.06**	**13.38**	**15.88**	**15.20**

CORN—Continued.

Average farm price of corn per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900	1901	1902	1903	1904	1905	1906	1907	1908	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
Maine	102	78	68	61	55	76	74	66	81	69	64	75	84	77	81	87	88	85	80
New Hampshire	95	77	66	60	56	78	73	63	72	69	64	75	79	80	76	88	85	78	76
Vermont	94	74	64	57	50	73	68	62	73	68	59	75	78	77	75	83	82	80	73
Massachusetts	92	76	64	60	54	76	74	66	72	70	60	75	81	83	81	85	90	88	81
Rhode Island	99	79	68	68	67	76	78	81	84	71	64	80	90	80	95	105	100	95	97
Connecticut	96	74	64	61	55	75	74	67	73	71	60	75	80	75	81	92	92	88	75
New York	77	63	57	54	47	72	67	60	64	61	59	71	80	72	78	81	80	77	74
New Jersey	69	59	54	49	45	66	56	57	58	55	53	63	69	70	76	85	87	82	71
Pennsylvania	66	57	51	48	45	62	58	57	59	54	52	64	73	70	74	80	83	81	70
North Atlantic	72.3	60.6	53.8	50.5	46.5	65.9	60.4	58.2	61.2	56.9	54.4	66.4	74.9	71.2	75.6	81.5	83.2	81.0	71.8
Delaware	58	49	44	41	38	57	49	49	49	47	42	52	59	61	71	85	85	78	58
Maryland	62	51	46	43	41	58	51	51	50	48	45	54	62	64	70	82	82	79	65
Virginia	57	51	47	47	49	59	52	53	59	53	55	64	71	72	78	88	92	83	74
West Virginia	56	50	50	51	50	65	54	64	64	53	55	72	77	81	86	93	91	77	74
North Carolina	65	57	53	55	57	73	60	61	62	64	68	74	79	83	89	97	101	93	85
South Carolina	90	72	60	62	64	84	69	69	70	74	73	78	91	88	94	103	104	95	90
Georgia	81	68	59	61	57	82	73	69	71	70	67	76	82	84	92	100	102	93	86
Florida	103	80	67	65	60	85	77	73	75	66	62	80	82	85	89	97	98	87	83
South Atlantic	68.3	57.8	52.9	53.3	53.0	69.6	60.1	61.4	63.3	60.6	61.1	70.6	77.1	78.9	85.3	94.3	96.3	87.8	80.3
Ohio	44	43	39	37	34	57	42	47	46	43	39	52	63	63	70	77	77	71	56
Indiana	38	38	36	33	32	55	36	36	41	38	36	45	60	60	65	74	73	64	50
Illinois	34	35	33	33	32	57	36	36	39	38	36	44	57	57	62	71	70	62	52
Michigan	54	46	44	41	37	52	52	46	52	46	44	55	64	64	70	75	76	65	61
Wisconsin	48	40	38	37	33	52	50	43	46	42	41	55	61	60	63	70	74	64	60
N. C. E. of Mississippi River	36.9	37.9	35.6	34.4	32.7	55.7	38.5	38.9	41.7	39.4	37.5	47.1	59.7	59.6	65.0	73.1	72.8	64.5	53.5
Minnesota	46	37	34	31	29	45	40	38	36	33	34	50	55	55	61	67	66	54	49
Iowa	30	27	30	29	27	52	33	38	33	34	32	43	52	51	57	66	65	59	49
Missouri	40	33	33	35	32	67	33	34	44	37	38	47	57	59	66	74	74	65	59
North Dakota	....	....	37	38	42	46	45	42	40	36	39	60	60	65	65	66	65	50	55
South Dakota	....	....	32	30	29	45	41	35	36	31	29	46	50	51	52	64	62	52	50
Nebraska	36	24	29	28	31	54	30	28	33	32	29	41	51	50	54	63	59	55	50
Kansas	42	28	32	33	32	63	34	36	41	33	32	44	55	56	61	71	65	58	54
N. C. W. of Mississippi River	36.0	28.9	31.0	30.9	29.9	54.7	33.0	34.5	36.2	33.7	32.5	44.3	53.4	53.5	58.8	67.8	65.5	58.4	52.3
Kentucky	41	42	40	42	40	61	42	56	49	43	42	53	65	66	74	81	82	73	62
Tennessee	47	42	41	44	49	65	47	49	50	50	47	57	64	67	74	84	86	75	70
Alabama	78	64	55	56	58	77	67	57	60	64	64	75	83	83	91	99	100	92	85
Mississippi	82	63	54	54	58	74	61	54	56	65	61	75	83	80	92	95	97	85	81
Louisiana	84	66	55	54	50	75	66	58	57	61	60	70	70	78	82	91	85	68	69
Texas	67	62	50	49	47	80	66	48	52	49	50	60	59	63	72	85	81	74	76
Oklahoma	....	....	....	39	29	76	41	38	40	34	31	44	51	56	64	72	67	57	55
Arkansas	66	53	47	48	43	81	49	51	53	55	47	68	66	70	78	88	87	72	72
South Central	57.4	50.5	46.3	46.7	46.5	72.5	49.9	50.0	50.2	48.2	46.3	58.8	63.3	66.4	74.7	84.2	82.3	72.3	69.2
Montana	....	88	70	66	59	90	72	62	68	68	65	68	90	90	96	120	125	....	86
Wyoming	....	....	62	61	60	72	59	58	57	75	59	70	76	70	....	....	95	72	78
Colorado	....	82	54	49	48	74	59	54	54	47	50	65	71	70	82	86	88	77	70
New Mexico	....	85	69	67	64	77	78	75	78	69	72	72	80	79	90	100	99	106	90
Arizona	....	84	75	94	73	90	101	90	91	97	85	90	105	115	119	124	107	108	100
Utah	....	77	61	66	63	90	67	70	72	70	74	72	72	80	76	88	100	85	87
Idaho	....	88	65	63	56	60	62	57	70	66	56	70	70	80	88	100	99	82	75
Washington	....	79	62	57	59	58	65	55	66	60	55	70	76	80	88	105	97	82	86
Oregon	88	81	62	60	57	57	66	67	61	59	65	74	77	78	87	100	100	85	80
California	100	79	60	66	61	68	77	74	78	76	67	85	88	82	93	104	130	97	91
Far Western	99.3	80.6	59.7	61.8	53.9	72.2	69.7	65.6	66.4	62.2	61.0	73.4	79.2	78.7	88.7	95.1	94.6	85.7	82.3
United States	47.8	40.1	38.2	37.1	35.7	60.5	40.3	42.5	44.1	41.2	39.9	51.6	60.6	61.4	67.5	76.3	75.2	67.1	59.6

CORN—Continued.

Wholesale prices of corn per bushel, 1896–1909.

Date.	New York. No. 2. Low.	New York. No. 2. High.	Baltimore. Mixed.[a] Low.	Baltimore. Mixed.[a] High.	Cincinnati. No. 2. Low.	Cincinnati. No. 2. High.	Chicago. No. 2. Low.	Chicago. No. 2. High.	Detroit. No. 3.[b] Low.	Detroit. No. 3.[b] High.	St. Louis. No. 2. Low.	St. Louis. No. 2. High.	San Francisco. No. 1 white (per cwt.). Low.	San Francisco. No. 1 white (per cwt.). High.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*		
1896	25¼	41	22	36½	22	32¼	19½	30⅝	20¼	32	17¼	27¾	$0.75	$0.91¼
1897	27	38	22	39	22½	33½	21¼	32⅜	21½	32½	19½	29½	.77½	1.12½
1898	33	44¼	29	43½	29	40	26	38	28½	39½	25½	36½	.85	1.17½
1899	36½	45⅝	34¾	43	31½	38	30	38½	32	38	29½	36¼	1.05	1.17½
1900	39⅞	52⅛	36⅝	48¾	32¾	47	30½	49½	32½	45	30½	45	1.00	1.30
1901	45½	72⅞	41½	68	38	71½	36	67½	37	70½	35	70	1.10	1.75
1902	57	73	43	77	44	69	43¾	88	57	70½	40½	60¼	1.30	1.65
1903	49¼	68½	46½	61	40	54½	41	53	40½	56½	39	55	1.17½	1.57½
1904	47⅝	69	49¼	58¾	45½	58½	42¾	59½	42	60	42½	57	1.25	1.55
1905	50¾	63½	42	65	44½	59½	42	64½	41¾	59	41½	58½	1.25	1.55
1906.														
January	49½	51¼	47¾	49⅞	44	46	41	43	44½	45¾	41¾	43⅜	......	......
February	47	49¾	45⅜	48⅜	42	44¾	41½	45½	45	46¾	39⅞	42⅜	......	......
March	47¼	52	46	49⅞	43	48	39	44	43¼	47	40¼	44½	......	......
April	52	56¼	49⅝	54¼	47	52½	43½	48	48½	52	43½	51½	......	......
May	55¾	58	55	57¼	51½	53½	47½	50	50¾	53½	49	51	......	......
June	58	61½	55	58	51½	54	50	54¾	52	55	48	53½	......	......
July	56¾	60	55¼	57¾	53½	55½	49¾	53¼	53	55	50½	54½	......	......
August	55	58	54¼	55¾	50½	54¼	48¼	51	52¼	54	46½	51	......	......
September	56¼	58½	53½	54¾	48	50½	47	50	49	52	46	47½	......	......
October	54½	56	51⅛	54½	48	50	44¾	47¼	48¼	49¾	44	46	......	......
November	52¾	56	49	52	47½	48½	44	47¼	48¾	49¾	41	45½	......	......
December	50	53	50	51½	43	48	40	46	43½	49½	39½	45	......	......
Year	47	61½	45⅝	58	42	55½	39	64¾	43	55	39½	54½	......	......
1907.														
January	49½	52	47	50	43	47	39¾	43½	43	46	39	43	1.25	1.40
February	51¾	54½	49⅝	51⅛	46	48	43	44¼	45¾	46½	42½	45½	1.25	1.35
March	51¾	54	49⅛	51	46½	48¼	43	45	45	47	43	45½	1.27½	1.35
April	51¾	57¾	50½	56⅞	47½	53½	44¼	50¾	45½	50½	43	50¼	1.27½	1.40
May	56¼	63	55⅞	60¾	52½	57½	49¼	56	50½	56¼	49	55½	1.35	1.55
June	60½	65	58⅛	60⅝	55	56½	51¾	54½	53½	56½	50¾	54	......	......
July	60	63	58	61¾	55½	57	52	55¼	54¾	57	51¾	55	1.50	1.60
August	60¼	67⅝	59	63¾	56¾	63	54	61½	57	62	53¼	60	1.50	1.57½
September	67¼	77	64	70	63	66	60½	63¾	62	69½	59	63	1.52½	1.60
October	69	76⅛	64	74½	58	71	55¾	66¼	63	69½	53½	66	......	......
November	64½	71¼	61¼	67	59	62½	55¼	60½	62	64	56	59½	......	......
December	67	76	59¾	68½	60	61½	57½	61½	58	64½	51½	59	......	......
Year	49½	77	47	74½	43	71	39¾	66½	43	69½	39	66	1.25	1.60
1908.							(c)							
January	63½	69½	59⅞	65¾	55½	56	57	60	54½	59½	54¼	57½	......	......
February	60¾	63¼	59⅜	61½	54½	60½	56½	59½	53½	61½	54¼	59	......	......
March	62¾	70	62	66⅞	60½	60¼	58½	66	61½	65½	58½	64½	1.60	1.70
April	69¼	75	66½	71	66½	69½	65	68	65	68½	63	67	1.65	1.70
May	72½	77½	71¼	74½	69½	76	67¾	82	69	75	67	73¾	1.65	1.80
June	74½	78	73½	76	70½	74½	67¼	74½	71½	75	70½	75	1.80	1.87½
July	78¼	85	75½	80	71	81½	70½	78	72	79	74	81¼	1.80	1.90
August	......	......	80	83½	70½	82	77½	80	78¾	80	76	79½	1.85	1.90
September	......	......	......	......	79½	83½	78	82	80	83	76½	81½	......	......
October	......	......	......	......	66½	79½	66	79	75	80	63½	77	1.85	1.90
November	71	74	67¾	71	63	66	62	66½	63	72	61	66½	......	......
December	65	71	63⅜	67½	58½	64	56¾	62¼	59	63	56¼	63	......	......
Year	60½	85	59⅜	83½	54½	83½	56½	82	53½	83	54¼	81½	1.60	1.90
1909.														
January	66	71	64½	67	61	62½	58¼	60¾	60½	62½	58	61½	1.72½	1.75
February	71	74½	67⅛	71¾	61½	68½	61	65½	62½	67½	61	65	......	......
March	74½	76½	70⅛	73¼	66½	69	64	67½	66¼	68½	64½	67	......	......
April	75½	82½	72⅞	79	68½	76½	66½	72½	68	75	66	74½	1.90	1.95
May	82	86¾	78⅛	82	76	78	72¾	76	75	79	73	77	1.85	1.95
June	80	86	76⅝	81½	74	77	71½	77	75¾	77½	71½	75½	......	......
July	78	81	74	77½	72	75½	68	74¼	73	75½	67½	74½	......	......
August	77½	80½	72	76	69	74	66½	70	71½	74	64	69	1.80	1.85
September	74	79	74	74½	65½	72	63	69¼	66	74	62¾	69½	......	......
October	68½	73	64¾	68¼	61	66	59	62	62½	65	59	63¼	......	......
November	69½	73	64⅞	69	57	63½	61¼	64½	60½	64	58	63	1.80	1.85
December	70½	73½	63⅜	67¼	57	64	62½	66	59	63¼	58	63¾	1.75	1.85
Year	66	86¾	63⅜	82	57	78	58¼	77	59	79	58	77	1.72½	1.95

[a] No. 2 grade, 1896 to 1900. [b] No. 2 grade, 1896 to 1904. [c] Contract.

CORN—Continued.

International trade in corn, including corn meal, 1904–1908.

General Note.—Substantially the international trade of the world. It should not be expected that the world export and import totals for any year will agree. Among sources of disagreement are these: (1) Different periods of time covered in the "year" of the various countries; (2) imports received in year subsequent to year of export; (3) want of uniformity in classification of goods among countries; (4) different practices and varying degrees of failure in recording countries of origin and ultimate destination; (5) different practices of recording reexported goods; (6) opposite methods of treating free ports; (7) clerical errors, which, it may be assumed, are not infrequent.

The exports given are domestic exports, and the imports given are imports for consumption as far as it is feasible and consistent so to express the facts. While there are some inevitable omissions, on the other hand, there are some duplications because of reshipments that do not appear as such in official reports. For the United Kingdom import figures refer to imports for consumption, when available, otherwise total imports less exports of "foreign and colonial merchandise."

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Argentina	Jan. 1	97,221,783	87,487,629	106,047,790	50,262,705	67,390,728
Austria-Hungary	Jan. 1	174,342	63,218	22,361	120,144	307,092
Belgium	Jan. 1	6,287,688	8,078,215	6,588,557	7,644,848	6,134,920
Bulgaria	Jan. 1	9,762,657	3,870,090	5,658,543	10,225,452	4,393,880
Netherlands	Jan. 1	4,440,009	4,278,515	6,010,176	8,215,931	6,957,524
Roumania	Jan. 1	18,042,377	1,441,437	23,756,349	54,721,194	28,959,000
Russia	Jan. 1	18,633,663	7,372,386	9,879,982	38,636,221	[a] 23,532,003
Servia	Jan. 1	130,225	806,115	1,755,446	4,046,392	1,934,483
United States	Jan. 1	47,896,231	113,189,271	105,258,629	86,524,012	39,013,273
Uruguay	July 1	2,002,431	28,519	9,746	88,659	[b] 88,659
Other countries		346,346	4,199,950	2,713,077	5,214,098	[a] 5,881,329
Total		204,946,752	230,815,345	267,700,656	265,699,656	184,592,891

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	14,090,377	18,511,368	7,198,839	4,002,712	3,106,663
Belgium	Jan. 1	19,474,330	24,169,780	20,125,507	23,505,832	19,158,096
British South Africa [c]	Jan. 1	2,659,912	3,448,954	315,835	51,298	145,275
Canada	Jan. 1	8,896,007	11,898,604	12,714,257	16,187,579	6,812,833
Cuba	Jan. 1	696,517	1,843,348	2,489,087	3,153,495	[b] 3,153,495
Denmark	Jan. 1	9,284,777	10,859,257	18,855,752	2,383,282	10,445,555
Egypt	Jan. 1	53,017	1,279,749	1,438,435	196,539	845,205
France	Jan. 1	10,124,353	11,122,512	14,509,103	16,850,618	9,629,979
Germany [d]	Jan. 1	30,450,853	36,538,366	44,883,052	49,293,029	26,372,295
Italy	Jan. 1	8,365,123	5,902,875	8,666,763	2,815,120	2,987,496
Mexico	Jan. 1	121,138	1,115,007	1,882,218	1,554,145	179,157
Netherlands	Jan. 1	16,547,198	16,234,785	25,305,233	29,192,195	25,261,400
Norway	Jan. 1	555,901	544,596	718,276	1,937,926	809,841
Portugal	Jan. 1	531,889	2,724,050	370,611	577,726	2,015,388
Russia	Jan. 1	625,526	163,979	456,481	550,841	[a] 343,072
Spain	Jan. 1	2,761,426	1,904,186	2,647,975	4,552,178	3,318,904
Sweden	Jan. 1	234,986	491,035	564,946	330,588	488,077
Switzerland	Jan. 1	2,704,457	2,498,380	2,887,291	2,867,764	2,480,164
United Kingdom	Jan. 1	86,076,697	84,156,490	97,736,853	106,708,048	68,186,271
Other countries		3,306,140	7,432,369	4,812,269	3,163,038	[a] 3,671,563
Total		217,560,714	242,839,690	268,578,783	269,873,953	189,410,729

[a] Preliminary.
[b] Year preceding.
[c] Cape Colony and Transvaal before 1906.
[d] Not including free ports prior to March 1, 1906.

WHEAT.

Wheat area of countries named, 1905–1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
United States	47,854,100	47,305,800	45,211,000	47,557,000	46,723,000
Canada:					
New Brunswick	20,700	20,800	20,600	20,200	19,600
Ontario	986,300	959,000	820,700	812,400	705,800
Manitoba	2,643,600	3,141,500	2,789,500	2,957,000	2,808,000
Saskatchewan	1,130,100	1,730,600	2,047,700	2,396,000	5,685,000
Alberta	107,500	177,100	207,900	271,000	385,000
Other	(a)	(a)	164,000	153,700	147,000
Total Canada	......	......	6,050,100	6,610,300	7,750,400
Mexico	(a)	(a)	(a)	(a)	(a)
SOUTH AMERICA.					
Argentina	12,115,800	14,023,900	14,065,800	13,703,800	15,333,500
Chile	(a)	(a)	(a)	1,137,700	(a)
Uruguay	644,400	712,800	623,300	611,800	(a)
EUROPE.					
Austria-Hungary:					
Austria	2,782,300	2,869,700	2,914,500	2,959,600	2,942,100
Hungary proper	8,444,100	8,785,400	8,069,300	8,715,000	8,036,500
Croatia-Slavonia	753,600	735,700	708,000	758,800	762,200
Bosnia-Herzegovina	(a)	324,400	247,900	272,100	205,100
Total Austria-Hungary	......	12,715,200	11,939,700	12,705,500	11,945,900
Belgium	402,500	370,800	392,500	388,000	395,400
Bulgaria	2,420,600	2,494,800	2,414,700	2,422,700	(a)
Denmark	100,900	100,900	100,800	100,800	100,800
Finland	(a)	(a)	(a)	(a)	(a)
France	16,085,800	16,103,200	16,253,200	16,220,800	16,236,000
Germany	4,762,000	4,783,900	4,316,400	4,656,900	4,525,400
Greece	(a)	(a)	(a)	(a)	(a)
Italy	13,134,300	12,692,900	12,923,200	12,621,100	(a)
Montenegro	(a)	(a)	(a)	(a)	(a)
Netherlands	150,700	140,300	134,500	139,000	(a)
Norway	(a)	(a)	12,400	12,400	12,400
Portugal	(a)	(a)	(a)	(a)	(a)
Roumania	4,838,900	4,998,500	4,236,100	4,452,000	4,173,700
Russia:					
Russia proper	48,071,200	49,017,000	45,574,000	46,607,700	(b)
Poland	1,221,100	1,259,700	1,245,700	1,218,700	(b)
Northern Caucasia	7,636,400	8,304,300	8,124,900	7,958,600	(b)
Total Russia (European)	56,928,700	58,581,000	54,944,600	55,785,000	......
Servia	919,600	921,400	908,400	931,300	(a)
Spain	8,879,200	9,298,300	9,137,700	9,283,000	9,347,200
Sweden	205,700	212,100	216,900	(a)	(a)
Switzerland	(a)	(a)	(a)	106,300	104,800
Turkey (European)	(a)	(a)	(a)	(a)	(a)
United Kingdom:					
Great Britain—					
England	1,704,300	1,661,100	1,537,200	1,548,700	1,734,200
Scotland	48,600	50,100	48,300	43,400	49,700
Wales	43,900	44,400	39,900	34,600	40,000
Ireland	37,900	43,900	38,200	36,700	43,600
Total United Kingdom	1,834,700	1,799,500	1,663,600	1,663,400	1,867,500
ASIA.					
British India, including such native States as report	28,470,200	26,357,400	20,212,500	22,824,500	25,978,200
Cyprus	(a)	(a)	(a)	(a)	(a)
Japanese Empire:					
Japan	1,111,300	1,086,100	1,088,400	1,101,800	(a)
Formosa	(a)	(a)	(a)	(a)	(a)
Persia	(a)	(a)	(a)	(a)	(a)

[a] No official statistics of area; estimates of production on p. 444.
[b] No detailed official statistics of either area or production.

WHEAT—Continued.

Wheat area of countries named, 1905-1909—Continued.

Country.	1905.	1906.	1907.	1908.	1909.
ASIA—continued.					
Russia:	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Central Asia	1,781,800	1,237,600	2,016,200	2,155,200	(b)
Siberia	3,468,200	3,806,000	3,868,300	4,470,700	(b)
Transcaucasia	9,600	10,000	8,100	7,800	(b)
Total Russia (Asiatic)	5,279,600	5,053,600	5,892,600	6,633,700	....
Turkey (Asiatic)	(a)	(a)	(a)	(a)	(a)
AFRICA.					
Algeria	3,396,700	3,315,400	3,257,400	3,389,300	2,814,200
Cape of Good Hope	(a)	(a)	(a)	(a)	(a)
Egypt	1,296,700	1,341,400	1,339,400	1,284,300	1,376,500
Natal	500	600	400	400	(a)
Sudan (Anglo-Egyptian)	(a)	(a)	(a)	(a)	(a)
Tunis	(a)	1,005,700	1,099,600	1,087,300	(a)
AUSTRALASIA.					
Australia:					
Queensland	151,000	119,400	114,600	82,500	80,900
New South Wales	1,775,900	1,939,400	1,866,200	1,390,200	1,394,100
Victoria	2,277,500	2,070,500	2,031,900	1,847,100	1,779,900
South Australia	1,840,200	1,757,000	1,686,400	1,730,500	1,692,100
Western Australia	182,100	195,100	250,300	279,600	284,400
Tasmania	43,100	41,300	32,800	30,800	(a)
New Zealand	258,900	223,600	212,100	193,000	252,400
Total Australasia	6,528,700	6,346,300	6,194,300	5,553,700	....

Wheat crop of countries named, 1905-1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	692,979,000	735,261,000	634,087,000	664,602,000	737,189,000
Canada:					
New Brunswick	405,000	407,000	411,000	349,000	395,000
Ontario	21,517,000	22,109,000	18,019,000	18,057,000	16,262,000
Manitoba	55,761,000	61,250,000	39,688,000	50,269,000	52,706,000
Saskatchewan	26,107,000	37,040,000	27,692,000	34,742,000	85,197,000
Alberta	2,307,000	3,966,000	4,194,000	6,842,000	9,579,000
Other	3,000,000	3,000,000	2,687,000	2,175,000	2,605,000
Total Canada	109,097,000	127,772,000	92,691,000	112,434,000	166,744,000
Mexico	9,710,000	8,000,000	9,000,000	8,000,000	8,000,000
Total	811,786,000	871,033,000	735,778,000	785,036,000	911,933,000
SOUTH AMERICA.					
Argentina	150,745,000	134,931,000	155,993,000	192,489,000	161,672,000
Chile	12,089,000	12,157,000	15,776,000	18,915,000	20,000,000
Uruguay	7,565,000	4,606,000	6,867,000	7,430,000	8,000,000
Total	170,399,000	151,694,000	178,636,000	218,834,000	189,672,000
EUROPE.					
Austria-Hungary:					
Austria	54,531,000	58,255,000	52,369,000	62,129,000	58,468,000
Hungary proper	157,514,000	197,409,000	120,509,000	152,205,000	113,352,000
Croatia-Slavonia	13,077,000	10,351,000	10,170,000	13,220,000	11,662,000
Bosnia-Herzegovina	3,016,000	2,693,000	2,169,000	3,023,000	2,594,000
Total Austria-Hungary	228,138,000	268,708,000	185,217,000	230,577,000	186,076,000
Belgium	12,401,000	12,964,000	15,835,000	13,963,000	15,506,000
Bulgaria	34,949,000	39,109,000	23,545,000	36,496,000	37,000,000
Denmark	4,067,000	4,161,000	4,343,000	4,318,000	4,000,000
Finland	129,000	150,000	135,000	125,000	135,000
France	335,453,000	324,919,000	376,999,000	317,765,000	356,574,000
Germany	135,947,000	144,754,000	127,843,000	138,442,000	138,000,000

[a] No official statistics of area; estimates of production on p. 445.

[b] No detailed official statistics of either area or production.

WHEAT—Continued.

Wheat crop of countries named, 1905-1909—Continued.

Country.	1905.	1906.	1907.	1908.	1909.
EUROPE—continued.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Greece	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000
Italy	160,504,000	176,464,000	177,543,000	152,236,000	164,587,000
Montenegro	200,000	200,000	200,000	200,000	200,000
Netherlands	5,078,000	4,942,000	5,325,000	5,121,000	5,000,000
Norway	329,000	303,000	290,000	333,000	316,000
Portugal	5,000,000	9,000,000	6,000,000	5,000,000	5,000,000
Roumania	103,328,000	113,867,000	42,257,000	54,813,000	56,751,000
Russia:					
Russia proper	451,327,000	344,765,000	340,416,000	383,016,000	......
Poland	20,239,000	21,152,000	18,173,000	21,182,000	......
Northern Caucasia	96,708,000	85,046,000	79,184,000	84,964,000	......
Total Russia (European)	568,274,000	450,963,000	437,773,000	489,162,000	711,479,000
Servia	11,262,000	13,211,000	8,375,000	11,495,000	13,000,000
Spain	92,504,000	140,656,000	100,331,000	119,970,000	144,105,000
Sweden	5,529,000	6,650,000	6,279,000	6,756,000	6,978,000
Switzerland	4,006,000	4,000,000	4,000,000	3,527,000	3,568,000
Turkey (European)	20,000,000	25,000,000	18,000,000	25,000,000	30,000,000
United Kingdom:					
Great Britain—					
England	57,424,000	57,583,000	53,855,000	51,371,000	60,241,000
Scotland	2,131,000	2,063,000	1,953,000	1,854,000	2,111,000
Wales	1,204,000	1,308,000	1,138,000	966,000	1,147,000
Ireland	1,475,000	1,575,000	1,367,000	1,438,000	1,809,000
Total United Kingdom	62,234,000	62,529,000	58,313,000	55,629,000	65,308,000
Total	1,797,326,000	1,810,550,000	1,606,603,000	1,678,038,000	1,951,563,000
ASIA.					
British India, including such native States as report	283,063,000	319,952,000	317,023,000	227,983,000	283,360,000
Cyprus	2,441,000	2,410,000	2,636,000	2,601,000	2,600,000
Japanese Empire:					
Japan	18,437,000	20,282,000	22,795,000	22,587,000	22,035,000
Formosa	200,000	178,000	200,000	200,000	200,000
Total Japanese Empire	18,637,000	20,460,000	22,995,000	22,787,000	22,235,000
Persia	16,000,000	16,000,000	16,000,000	16,000,000	16,000,000
Russia:					
Central Asia	25,491,000	11,486,000	27,085,000	21,416,000	......
Siberia	42,411,000	45,833,000	45,771,000	55,755,000	......
Transcaucasia	109,000	108,000	63,000	66,000	......
Total Russia (Asiatic)	68,011,000	57,427,000	72,919,000	77,237,000	71,792,000
Turkey (Asiatic)	35,000,000	35,000,000	35,000,000	35,000,000	35,000,000
Total	423,152,000	451,249,000	466,573,000	381,608,000	430,987,000
AFRICA.					
Algeria	25,579,000	34,323,000	31,261,000	30,000,000	34,769,000
Cape of Good Hope	2,000,000	2,000,000	2,000,000	1,916,000	2,257,000
Egypt	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000
Natal	4,000	8,000	3,000	3,000	5,000
Sudan (Anglo-Egyptian)	483,000	542,000	500,000	500,000	500,000
Tunis	5,729,000	4,906,000	6,314,000	2,838,000	4,000,000
Total	58,795,000	66,779,000	65,078,000	60,257,000	66,531,000
AUSTRALASIA.					
Australia:					
Queensland	2,217,000	1,173,000	1,144,000	715,000	1,241,000
New South Wales	16,983,000	21,391,000	22,506,000	9,444,000	15,971,000
Victoria	21,666,000	24,156,000	23,331,000	12,482,000	24,082,000
South Australia	12,454,000	20,778,000	18,017,000	19,739,000	20,009,000
Western Australia	2,077,000	2,381,000	2,845,000	3,018,000	2,535,000
Tasmania	818,000	801,000	672,000	665,000	825,000
Total Australia	56,215,000	70,680,000	68,515,000	46,063,000	64,663,000
New Zealand	9,411,000	7,013,000	5,782,000	5,743,000	9,049,000
Total Australasia	65,626,000	77,693,000	74,297,000	51,806,000	73,712,000
Grand total	3,327,084,000	3,428,996,000	3,126,965,000	3,176,479,000	3,624,418,000

WHEAT—Continued.

Acreage, production, value, prices, and exports of wheat in the United States, 1849–1909.

Year.	Acreage harvested.	Average yield per acre.	Production.	Average farm price per bushel December 1.	Farm value December 1.	Chicago cash price per bushel, No. 1 northern. December. Low.	December. High.	May of following year. Low.	May of following year. High.	Domestic exports, including flour, fiscal year beginning July 1.	Per cent of crop exported.
	Acres.	*Bush.*	*Bushels.*	*Cents.*	*Dollars.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Bushels.*	*P. ct.*
1849 [a]	....	.....	100,486,000	.....	....	.....	.....	.....	.....	7,535,901	7.5
1859 [a]	....	.....	173,105,000	.....	....	.....	.....	.....	.....	17,213,133	9.9
1866	15,424,000	9.9	152,000,000	152.7	232,110,000	129	145	185	211	12,646,941	8.3
1867	18,322,000	11.6	212,441,000	145.2	308,387,000	126	140	134	161	26,323,014	12.4
1868	18,460,000	12.1	224,037,000	108.5	243,033,000	80	88	87	96	29,717,201	13.3
1869	19,181,000	13.6	260,147,000	76.5	199,025,000	63	76	79	92	53,900,780	20.7
1870	18,993,000	12.4	235,885,000	94.4	222,767,000	91	98	113	120	52,574,111	22.3
1871	19,944,000	11.6	230,722,000	114.5	264,076,000	107	111	120	143	38,995,755	16.9
1872	20,858,000	11.9	249,997,000	111.4	278,522,000	97	108	112	122	52,014,715	20.8
1873	22,172,000	12.7	281,255,000	106.9	300,670,000	96	106	105	114	91,510,398	32.5
1874	24,967,000	12.3	308,103,000	86.3	265,881,000	78	83	78	94	72,912,817	23.7
1875	26,382,000	11.1	292,136,000	89.5	261,397,000	82	91	89	100	74,750,682	25.6
1876	27,627,000	10.5	289,357,000	96.3	278,697,000	104	117	130	172	57,043,936	19.7
1877	26,278,000	13.9	364,194,000	105.7	385,089,000	103	108	98	113	92,141,626	25.3
1878	32,109,000	13.1	420,122,000	77.6	325,814,000	81	84	91	102	150,502,506	35.8
1879	32,546,000	13.8	448,757,000	110.8	497,030,000	122	133½	112½	119	180,304,180	40.2
1880	37,987,000	13.1	498,550,000	95.1	474,202,000	93½	109¾	101	112⅝	186,321,514	37.4
1881	37,709,000	10.2	383,280,000	119.2	456,880,000	124¾	129	123	140	121,892,389	31.8
1882	37,067,000	13.6	504,185,000	88.4	445,602,000	91⅛	94¾	108	113⅜	147,811,316	29.3
1883	36,456,000	11.6	421,086,000	91.1	383,649,000	94⅞	99¼	85	94¾	111,534,182	26.5
1884	39,476,000	13.0	512,765,000	64.5	330,862,000	69¼	76⅞	85⅝	90¾	132,570,366	25.9
1885	34,189,000	10.4	357,112,000	77.1	275,320,000	82⅞	89	72⅛	79	94,565,793	26.5
1886	36,806,000	12.4	457,218,000	68.7	314,226,000	75⅛	79½	80¾	88¾	153,804,969	33.6
1887	37,642,000	12.1	456,329,000	68.1	310,613,000	75⅛	79¼	81½	89⅞	119,625,344	26.2
1888	37,336,000	11.1	415,868,000	92.6	385,248,000	96⅞	105½	77¼	95½	88,600,743	21.3
1889	38,124,000	12.9	490,560,000	69.8	342,492,000	76¾	80½	89¾	100	109,430,467	22.3
1890	36,087,000	11.1	399,262,000	83.8	334,774,000	87½	92¾	98⅞	108¼	106,181,316	26.6
1891	39,917,000	15.3	611,780,000	83.9	513,473,000	89⅝	93½	80	85¾	225,665,811	36.9
1892	38,554,000	13.4	515,949,000	62.4	322,112,000	69½	73	68¼	76¼	191,912,635	37.2
1893	34,629,000	11.4	396,132,000	53.8	213,171,000	59¼	64½	52⅛	60½	164,283,129	41.5
1894	34,882,000	13.2	460,267,000	49.1	225,902,000	52¾	63⅝	60¾	85⅛	144,812,718	31.5
1895	34,047,000	13.7	467,103,000	50.9	237,939,000	53½	64¾	57⅛	67⅞	126,443,968	27.1
1896	34,619,000	12.4	427,684,000	72.6	310,598,000	74⅝	93⅛	68¼	97⅞	145,124,972	33.9
1897	39,465,000	13.4	530,149,000	80.8	428,547,000	92	109	117	185	217,306,005	41.0
1898	44,055,000	15.3	675,149,000	58.2	392,770,000	62¾	70	68⅞	79½	222,618,420	33.0
1899	44,593,000	12.3	547,304,000	58.4	319,545,000	64	69½	63⅝	67½	186,096,762	34.0
1900	42,495,000	12.3	522,230,000	61.9	323,515,000	69½	74⅝	70	75⅛	215,990,073	41.4
1901	49,896,000	15.0	748,460,000	62.4	467,350,000	73	79¼	72⅝	76¼	234,772,516	31.4
1902	46,202,000	14.5	670,063,000	63.0	422,224,000	71⅞	77¾	74¾	80⅛	202,905,598	30.3
1903	49,465,000	12.9	637,822,000	69.5	443,025,000	77¼	87	87¾	101½	120,727,613	18.9
1904	44,075,000	12.5	552,400,000	92.4	510,490,000	115	122	89½	113¾	44,112,910	8.0
1905	47,854,000	14.5	692,979,000	74.8	518,373,000	82½	90	80¼	87½	97,609,007	14.1
1906	47,306,000	15.5	735,261,000	66.7	490,333,000	[b] 72⅝	[b] 75	84	106	146,700,425	20.0
1907	45,211,000	14.0	634,087,000	87.4	554,437,000	[b] 104½	[b] 109	[b] 103	[b] 111¼	163,043,669	25.7
1908	47,557,000	14.0	664,602,000	92.8	616,826,000	106½	112	126½	137	114,268,468	17.2
1909	46,723,000	15.8	737,189,000	99.0	730,046,000	106	119¾	.....	.....	....	.....

[a] Census figures of production.

[b] No. 2 red winter.

WHEAT—Continued.

Acreage, production, and farm value December 1, of winter and spring wheat, by States, in 1909, and United States totals, 1890 to 1908.

State, Territory, and Year.	Winter wheat.					Spring wheat.				
	Acreage.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.	Acreage	Average yield per acre.	Production	Average farm price Dec. 1.	Farm value Dec. 1.
	Acres.	*Bu.*	*Bu.*	*Cts.*	*Dollars.*	*Acres.*	*Bu.*	*Bu.*	*Cts.*	*Dollars.*
Me.						9,000	25.5	230,000	110.0	253,000
Vt.						1,000	25.0	25,000	120.0	30,000
N. Y.	420,000	21.0	8,820,000	111.0	9,790,000					
N. J.	110,000	17.9	1,969,000	109.0	2,146,000					
Pa.	1,545,000	17.0	26,265,000	109.0	28,629,000					
Del.	118,000	14.0	1,652,000	104.0	1,718,000					
Md.	770,000	14.5	11,165,000	110.0	12,282,000					
Va.	790,000	11.2	8,848,000	115.0	10,175,000					
W. Va.	370,000	13.0	4,810,000	113.0	5,435,000					
N. C.	570,000	9.5	5,415,000	127.0	6,877,000					
S. C.	381,000	10.0	3,810,000	146.0	5,563,000					
Ga.	245,000	10.0	2,450,000	145.0	3,552,000					
Ohio	1,480,000	15.9	23,532,000	112.0	26,056,000					
Ind.	2,165,000	15.3	33,124,000	110.0	36,436,000					
Ill.	1,810,000	17.4	31,494,000	104.0	32,754,000					
Mich.	775,000	18.8	14,570,000	112.0	16,318,000					
Wis.	59,000	20.4	1,204,000	96.0	1,156,000	120,000	19.0	2,280,000	96.0	2,189,000
Minn.						5,600,000	16.8	94,080,000	96.0	90,317,000
Iowa	*144,000*	*21.6*	*3,110,000*	*93.0*	*2,892,000*	*295,000*	*14.7*	*4,336,000*	*93.0*	*4,032,000*
Mo.	1,943,000	14.7	28,562,000	105.0	29,990,000					
N. Dak.						6,625,000	13.7	90,762,000	92.0	83,501,000
S. Dak.						3,375,000	14.1	47,588,000	90.0	42,829,000
Nebr.	2,350,000	19.4	45,590,000	89.0	40,575,000	290,000	14.0	4,060,000	89.0	3,613,000
Kans.	5,895,000	14.5	85,478,000	96.0	82,059,000	150,000	11.5	1,725,000	96.0	1,656,000
Ky.	670,000	11.8	7,906,000	111.0	8,776,000					
Tenn.	800,000	10.4	8,320,000	115.0	9,568,000					
Ala.	98,000	10.5	1,029,000	130.0	1,338,000					
Miss.	1,000	11.0	11,000	121.0	13,000					
Tex.	555,000	9.1	5,050,000	118.0	5,959,000					
Okla.	*1,225,000*	*12.8*	*15,680,000*	*101.0*	*15,837,000*					
Ark.	151,000	11.4	1,721,000	110.0	1,893,000					
Mont.	185,000	32.5	6,012,000	87.0	5,230,000	165,000	28.8	4,752,000	87.0	4,134,000
Wyo.	25,000	32.5	812,000	99.0	804,000	55,000	27.0	1,485,000	99.0	1,470,000
Colo.	90,000	29.7	2,673,000	93.0	2,486,000	275,000	29.4	8,085,000	93.0	7,519,000
N. Mex.						41,000	24.5	1,004,000	117.0	1,175,000
Ariz.						16,000	25.0	400,000	139.0	556,000
Utah	135,000	24.0	3,240,000	90.0	2,916,000	100,000	28.5	2,850,000	90.0	2,565,000
Nev.						36,000	28.7	1,033,000	104.0	1,074,000
Idaho	315,000	29.0	9,135,000	87.0	7,947,000	205,000	26.0	5,330,000	87.0	4,637,000
Wash.	780,000	25.8	20,124,000	93.0	18,715,000	760,000	20.6	15,656,000	93.0	14,560,000
Oreg.	535,000	21.0	11,235,000	93.0	10,449,000	275,000	18.7	5,142,000	93.0	4,782,000
Cal.	825,000	14.0	11,550,000	111.0	12,820,000					
U. S.	28,330,000	15.8	446,366,000	102.9	459,154,000	18,393,000	15.8	290,823,000	93.1	270,892,000
1908	30,349,000	14.4	437,908,000	93.7	410,330,000	17,208,000	13.2	226,694,000	91.1	206,496,000
1907	28,132,000	14.6	409,442,000	88.2	361,217,000	17,079,000	13.2	224,645,000	86.0	193,220,000
1906	29,600,000	16.7	492,888,000	68.3	336,435,000	17,706,000	13.7	242,373,000	63.5	153,898,000
1905	29,864,000	14.3	428,462,000	78.2	334,987,000	17,990,000	14.7	264,517,000	69.3	183,386,000
1904	26,866,000	12.4	332,935,000	97.8	325,611,000	17,209,000	12.8	219,464,000	84.2	184,879,000
1903	32,511,000	12.3	399,867,000	71.6	286,243,000	16,954,000	14.0	237,955,000	65.9	156,782,000
1902	28,581,000	14.4	411,789,000	64.8	266,727,000	17,621,000	14.7	258,274,000	60.2	155,497,000
1901	30,240,000	15.2	458,835,000	66.1	303,227,000	19,656,000	14.7	289,626,000	56.7	164,133,000
1900	26,236,000	13.3	350,025,000	63.3	221,668,000	16,259,000	10.6	172,204,000	59.1	101,847,000
1899	25,358,000	11.5	291,706,000	63.0	183,767,000	19,235,000	13.3	255,598,000	53.1	135,778,000
1898	25,745,000	14.9	382,492,000	62.2	237,736,000	18,310,000	16.0	292,657,000	53.0	155,034,000
1897	22,926,000	14.1	323,616,000	85.1	275,323,000	16,539,000	12.5	206,533,000	74.2	153,224,000
1896	22,794,000	11.8	267,934,000	77.0	206,270,000	11,825,000	13.5	159,750,000	65.3	104,328,000
1895	22,609,000	11.6	261,242,000	57.8	150,944,000	11,438,000	18.0	205,861,000	42.3	86,995,000
1894	23,519,000	14.0	329,290,000	49.8	164,022,000	11,364,000	11.5	130,977,000	47.2	61,880,000
1893	23,118,000	12.0	278,469,000	56.3	156,720,000	11,511,000	10.2	117,662,000	48.0	56,451,000
1892	26,209,000	13.7	359,416,000	65.1	234,037,000	12,345,000	12.7	156,531,000	56.3	88,075,000
1891	27,524,000	14.7	405,116,000	88.0	356,415,000	12,393,000	16.7	206,665,000	76.0	157,058,000
1890	23,520,000	10.9	255,374,000	87.5	223,362,000	12,567,000	11.4	143,890,000	77.4	111,411,000

WHEAT—Continued.

Acreage, production, value, and distribution of wheat in the United States in 1909, by States.

[Quantity expressed in bushels, 000 omitted.]

State, Territory, or Division.	Crop of 1909.			Farm reserves of preceding year's growth July 1—			Farm reserves March 1—			Shipped out of county where grown.		
	Acreage.	Production.	Farm value Dec. 1.	1909.		10-year average.	1910.		10-year average.	1910.		10-year average.
	Acres.	*Bush.*	*Dollars.*	*Bush.*	*P.c.*	*P.c.*	*Bush.*	*P.c.*	*P.c.*	*Bush.*	*P.c.*	*P.c.*
Maine	9,000	230	253,000	19	10.0	12.3	99	43	33	0	0	0
Vermont	1,000	25	30,000	0	1.0	5.0	9	35	37	0	0	0
New York	420,000	8,820	9,790,000	248	3.2	7.0	2,470	28	28	2,293	26	19
New Jersey	110,000	1,969	2,146,000	43	2.3	6.4	512	26	25	591	30	21
Pennsylvania	1,545,000	26,265	28,629,000	882	3.0	9.1	9,455	36	35	8,405	32	25
N. Atlantic	2,085,000	37,309	40,848,000	1,192	3.0	8.5	12,545	33.6	32.9	11,289	30.3	23.3
Delaware	118,000	1,652	1,718,000	17	1.0	3.2	330	20	25	909	55	54
Maryland	770,000	11,165	12,282,000	63	.5	4.5	2,233	20	21	6,252	56	61
Virginia	790,000	8,848	10,175,000	178	2.0	5.6	2,654	30	26	2,477	28	34
West Virginia	370,000	4,810	5,435,000	141	3.0	8.7	1,347	28	29	770	16	15
North Carolina	570,000	5,415	6,877,000	136	2.4	6.4	1,462	27	28	271	5	6
South Carolina	381,000	3,810	5,563,000	79	2.8	3.5	914	24	18	76	2	2
Georgia	245,000	2,450	3,552,000	33	1.5	3.7	539	22	22	74	3	4
S. Atlantic	3,244,000	38,150	45,602,000	647	1.7	5.3	9,479	24.8	24.1	10,829	28.4	32.9
Ohio	1,480,000	23,532	26,056,000	1,166	3.5	9.5	6,354	27	29	10,354	44	42
Indiana	2,105,000	33,124	36,436,000	1,581	3.5	6.8	6,956	21	22	18,549	56	46
Illinois	1,810,000	31,494	32,754,000	453	1.5	4.4	6,614	21	20	18,896	60	41
Michigan	775,000	14,570	16,318,000	393	2.5	7.5	4,225	29	26	6,702	46	39
Wisconsin	179,000	3,484	3,345,000	133	4.0	9.9	1,080	31	33	766	22	17
N. C. E. Miss. R.	6,409,000	106,204	114,909,000	3,726	2.9	7.1	25,229	23.8	24.2	55,267	52.0	42.0
Minnesota	5,600,000	94,080	90,317,000	2,262	3.3	8.6	24,461	26	28	62,093	66	68
Iowa	439,000	7,446	6,924,000	161	2.0	6.2	2,383	32	30	3,425	46	31
Missouri	1,943,000	28,562	29,990,000	334	1.5	5.8	4,856	17	21	12,853	45	41
North Dakota	6,625,000	90,762	83,501,000	1,642	2.4	4.2	22,690	25	21	68,979	76	80
South Dakota	3,375,000	47,588	42,829,000	1,022	2.7	7.0	12,373	26	26	34,263	72	76
Nebraska	2,640,000	49,650	44,188,000	1,107	2.5	7.9	12,909	26	28	33,762	68	62
Kansas	6,045,000	87,203	83,715,000	951	1.2	6.4	17,441	20	21	61,914	71	71
N. C. W. Miss. R.	26,667,000	405,291	381,464,000	7,479	2.3	6.5	97,113	24.0	24.0	277,289	68.4	68.0
Kentucky	670,000	7,906	8,776,000	141	1.6	6.3	1,344	17	20	2,451	31	31
Tennessee	800,000	8,320	9,568,000	205	2.5	5.2	1,581	19	22	2,330	28	29
Alabama	98,000	1,029	1,338,000	11	1.0	3.5	185	18	18	31	3	3
Mississippi	1,000	11	13,000	0	1.0	1.3	2	16	12	0	1	0
Texas	555,000	5,050	5,959,000	152	1.5	3.8	303	6	13	1,464	29	23
Oklahoma	1,225,000	15,680	15,837,000	266	1.7	4.9	1,725	11	16	9,878	63	60
Arkansas	151,000	1,721	1,893,000	28	1.7	6.8	258	15	24	86	5	8
S. Central	3,500,000	39,717	43,384,000	803	1.8	5.0	5,398	13.6	17.4	16,240	40.9	37.8
Montana	350,000	10,764	9,364,000	74	2.0	7.5	3,229	30	29	4,844	45	29
Wyoming	80,000	2,297	2,274,000	21	1.2	5.7	804	35	27	276	12	5
Colorado	365,000	10,758	10,006,000	105	1.7	7.7	3,765	35	23	6,455	60	49
New Mexico	41,000	1,004	1,175,000	24	2.3	5.3	221	22	21	70	7	5
Arizona	16,000	400	556,000	5	1.2	3.0	32	8	15	32	8	10
Utah	235,000	6,090	5,481,000	175	3.0	10.4	2,010	33	34	2,253	37	33
Nevada	36,000	1,033	1,074,000	32	3.2	5.9	362	35	19	155	15	12
Idaho	520,000	14,465	12,584,000	131	1.2	5.7	3,616	25	24	10,126	70	60
Washington	1,540,000	35,780	33,275,000	217	.8	5.2	6,440	18	18	26,835	75	77
Oregon	810,000	16,377	15,231,000	197	1.3	6.0	2,293	14	18	9,335	57	58
California	825,000	11,550	12,820,000	234	2.0	5.3	808	7	14	6,122	53	65
Far Western	4,818,000	110,518	103,839,000	1,216	1.4	6.0	23,580	21.3	19.2	66,503	60.2	60.4
United States	46,723,000	737,189	730,046,000	15,062	2.3	6.8	173,344	23.5	23.8	437,417	59.3	56.6

WHEAT—Continued.

Condition of the wheat crop in the United States on the first of months named, 1888-1910.

Year.	Winter wheat.						Spring wheat.			
	December of previous year.	April.	May.	June.	July.	When harvested.[a]	June.	July.	August.	When harvested.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1888	95.9	82.0	73.1	73.3	75.6	77.3	92.8	95.9	87.3	......
1889	96.8	94.0	96.0	93.1	92.0	87.5	94.4	83.3	81.2	......
1890	95.3	81.0	80.0	78.1	76.2	75.5	91.3	94.4	83.2	......
1891	98.4	96.9	97.9	96.6	96.2	95.9	92.6	94.1	95.5	......
1892	85.3	81.2	84.0	88.3	89.6	85.3	92.3	90.9	87.3	......
1893	87.4	77.4	75.4	75.5	77.7	74.0	86.4	74.1	67.0	......
1894	91.5	86.7	81.4	83.2	83.9	83.7	88.0	68.4	67.1	......
1895	89.0	81.4	82.9	71.1	65.8	75.4	97.8	102.2	95.9	......
1896	81.4	77.1	82.7	77.9	75.6	74.6	99.9	93.3	78.9	......
1897	99.5	81.4	86.2	78.5	81.2	85.7	89.6	91.2	86.7	......
1898	......	86.7	86.5	90.8	85.7	86.7	100.9	95.0	96.5	......
1899	92.6	77.9	76.2	67.3	65.6	70.9	91.4	91.7	83.6	......
1900	97.1	82.1	88.9	82.7	80.8	69.6	87.3	55.2	56.4	......
1901	97.1	91.7	94.1	87.8	88.3	82.8	92.0	95.6	80.3	......
1902	86.7	78.7	76.4	76.1	77.0	80.0	95.4	92.4	89.7	......
1903	99.7	97.3	92.6	82.2	78.8	74.7	95.9	82.5	77.1	......
1904	86.6	76.5	76.5	77.7	78.7	......	93.4	93.7	87.5	66.2
1905	82.9	91.6	92.5	85.5	82.7	......	93.7	91.0	89.2	87.3
1906	94.1	89.1	90.9	82.7	85.6	......	93.4	91.4	86.9	83.4
1907	94.1	89.9	82.9	77.4	78.3	......	88.7	87.2	79.4	77.1
1908	91.1	91.3	89.0	86.0	80.6	......	95.0	89.4	80.7	77.6
1909	85.3	82.2	83.5	80.7	82.4	......	95.2	92.7	91.6	88.6
1910	95.8	......	......	......	......	......	......	......	......	......

[a] Includes both winter and spring.

Average yield of wheat in countries named, bushels per acre, 1889-1908.

Year.	United States.	Russia, European.[b]	Germany.[b]	Austria.[b]	Hungary proper.[b]	France.[a]	United Kingdom.[a]
Average (1889-1898)	13.5	8.7	23.5	15.7	....	18.2	30.9
1899	12.3	8.7	28.4	19.0	17.8	21.2	33.8
1900	12.3	8.3	27.9	15.5	16.9	19.2	29.5
1901	15.0	8.1	23.5	16.7	15.1	18.5	31.9
1902	14.5	11.1	30.3	19.0	20.7	20.2	33.9
1903	12.9	10.6	29.2	17.8	19.0	22.8	31.1
1904	12.5	11.5	29.5	19.5	16.3	18.5	27.8
1905	14.5	10.0	28.5	19.6	18.7	20.9	33.9
1906	15.5	7.7	30.3	20.2	22.5	20.2	34.7
1907	14.0	7.9	29.6	18.0	15.1	23.2	35.0
1908	14.0	8.8	29.7	21.0	17.4	19.0	32.4
Average (1899-1908)	13.7	9.3	28.7	18.7	17.1	20.4	32.6

[a] Winchester bushels. [b] Bushels of 60 pounds. [c] Average 1898-1907.

Per cent of winter wheat area sown which was abandoned (not harvested).

Year.	Per cent.	Year.	Per cent.	Year.	Per cent.
1899	13.5	1903	2.8	1907	11.2
1900	11.8	1904	15.4	1908	4.2
1901	6.7	1905	4.6	1909	7.2
1902	15.2	1906	5.5		

WHEAT—Continued

Average yield per acre of wheat in the United States.

State, Territory, or Division.	10-year averages. 1866–1875	10-year averages. 1876–1885.	10-year averages. 1886–1895.	10-year averages. 1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	13.2	13.7	15.8	22.1	19.5	23.9	25.3	25.5	23.3	23.0	24.8	26.2	23.5	25.5
New Hampshire	15.2	14.6	15.8	17.9	16.3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vermont	17.0	16.8	18.8	21.2	23.5	18.7	18.8	20.9	25.1	18.8	22.3	23.0	23.0	25.0
Connecticut	17.2	16.5	16.1	19.8	20.8	.....	.....	.....	.....	.....	.....	.....	.....	.....
New York	14.1	15.5	15.4	17.5	17.7	13.1	16.8	17.8	11.3	21.0	20.0	17.3	17.5	21.0
New Jersey	14.0	13.3	13.4	16.1	19.1	16.8	16.0	14.0	13.3	16.4	18.3	18.5	17.3	17.9
Pennsylvania	13.3	13.4	13.6	15.8	13.5	17.1	15.8	15.6	14.1	17.1	17.7	18.6	18.5	17.0
North Atlantic	13.7	14.1	14.1	16.3	14.6	16.1	16.1	16.1	13.5	17.9	18.2	18.4	18.3	17.9
Delaware	10.9	12.5	12.1	16.0	20.3	18.5	16.5	10.2	14.9	13.8	16.0	20.5	15.0	14.0
Maryland	10.6	12.8	13.3	15.9	19.5	17.2	14.7	12.5	13.4	16.3	16.0	19.0	16.4	14.5
Virginia	8.3	8.3	8.8	10.3	11.9	10.9	5.7	8.7	10.2	11.4	12.5	12.5	11.4	11.2
West Virginia	10.3	10.8	10.3	10.8	9.8	10.9	7.7	10.2	10.1	12.3	12.7	12.2	13.0	13.0
North Carolina	7.2	6.6	6.2	7.5	9.6	8.7	5.3	5.1	8.6	6.7	9.1	9.5	10.0	9.5
South Carolina	6.0	6.6	5.7	7.7	9.0	8.8	5.6	6.5	8.1	6.1	9.3	8.5	9.0	10.0
Georgia	6.9	6.9	6.1	7.9	9.1	8.2	6.0	6.2	8.8	6.9	10.0	9.0	9.2	10.0
South Atlantic	8.9	8.9	9.0	10.6	12.4	11.6	8.6	8.8	10.5	11.0	12.4	14.3	12.3	11.8
Ohio	12.0	14.6	14.4	13.8	6.0	15.3	17.1	13.7	11.5	17.1	20.4	16.3	16.0	15.9
Indiana	11.0	13.9	13.9	12.2	5.3	15.8	16.0	10.0	9.2	18.3	20.7	14.4	16.6	15.3
Illinois	11.9	13.1	14.3	13.0	13.0	17.6	17.9	8.4	13.8	16.0	19.5	18.0	13.0	17.4
Michigan	13.4	16.1	14.8	13.8	7.6	11.1	17.7	15.5	9.8	18.5	13.1	14.5	18.0	18.8
Wisconsin	13.7	12.2	13.0	15.7	15.5	16.1	18.1	15.6	15.5	16.6	16.3	14.1	18.2	19.5
N. Central E. of Miss. R	12.3	13.9	14.2	13.3	9.1	15.3	17.1	11.6	11.7	17.3	19.1	15.8	15.6	16.6
Minnesota	13.5	12.8	13.7	13.3	10.5	12.9	13.9	13.1	12.8	13.3	10.9	13.0	12.8	16.8
Iowa	12.6	10.2	12.9	14.1	15.6	16.2	12.7	12.4	11.6	14.2	15.7	13.4	17.2	17.0
Missouri	12.8	11.4	12.8	12.2	12.5	15.9	19.9	8.7	17.7	12.4	14.8	13.2	10.0	14.7
North Dakota	.	...	14.5	12.2	4.9	13.1	15.9	12.7	11.8	14.0	13.0	10.0	11.6	13.7
South Dakota	...	...	11.0	11.1	6.9	12.9	12.2	13.8	9.6	13.7	13.4	11.2	12.8	14.1
Nebraska	14.8	11.9	10.8	15.4	12.0	17.1	20.9	15.7	13.6	19.4	22.0	18.1	17.2	18.8
Kansas	15.7	13.9	12.8	13.7	17.7	18.5	10.4	14.1	12.4	13.9	15.1	11.0	12.6	14.4
N. Central W. of Miss. R	13.1	11.9	13.0	13.0	11.6	14.9	14.7	13.2	12.0	14.2	14.2	12.2	12.7	15.2
Kentucky	9.2	9.7	11.2	11.2	13.0	12.1	9.3	8.4	11.4	11.3	14.1	12.0	11.6	11.8
Tennessee	7.7	6.6	8.3	9.5	9.9	10.8	7.2	7.1	11.5	7.2	12.5	9.5	10.0	10.4
Alabama	7.6	6.4	6.9	9.1	9.5	8.7	6.0	9.1	10.3	9.6	11.0	10.0	11.5	10.5
Mississippi	9.2	6.2	6.9	9.4	9.6	8.8	8.0	8.0	8.8	10.8	10.0	11.0	14.5	11.0
Texas	12.8	10.8	10.4	12.3	18.4	8.9	9.0	13.4	10.7	8.9	11.5	7.4	11.0	9.1
Oklahoma	.....	.....	11.4	14.1	19.0	15.8	11.3	14.5	12.1	8.5	13.7	9.0	11.6	12.8
Arkansas	10.3	7.1	8.6	9.1	10.1	8.8	9.1	7.0	10.1	7.9	10.8	9.5	10.0	11.4
South Central	8.6	8.2	9.7	11.5	14.7	12.1	9.3	11.4	11.4	8.8	12.8	9.7	11.1	11.3
Montana	.....	17.7	19.8	26.9	26.6	26.5	26.0	28.2	23.9	23.8	24.0	28.8	24.2	30.8
Wyoming	.....	17.0	20.1	22.6	17.6	24.5	23.5	20.9	22.1	25.4	28.7	28.5	25.4	28.7
Colorado	.....	19.1	19.2	23.1	22.6	24.1	18.0	26.6	22.8	25.0	32.5	29.0	21.0	29.5
New Mexico	.....	13.6	14.7	19.6	21.0	21.5	17.1	18.4	12.8	22.2	25.0	24.0	25.0	24.5
Arizona	.....	13.9	15.2	21.6	14.6	21.8	18.7	25.3	25.5	24.4	25.2	25.9	26.7	25.0
Utah	.....	18.0	17.6	23.4	20.9	20.5	21.2	22.6	26.6	26.4	27.4	28.8	26.5	25.9
Nevada	21.6	18.1	17.4	25.9	24.5	25.1	27.1	27.6	26.2	27.0	31.5	32.0	30.0	28.7
Idaho	.....	17.2	18.4	23.8	20.8	21.2	22.1	21.1	22.9	28.2	24.4	25.3	28.2	27.8
Washington	.....	16.3	17.6	23.0	23.5	29.1	22.2	20.3	22.2	24.6	20.8	26.0	18.8	23.2
Oregon	18.9	17.5	16.7	18.4	13.8	21.1	20.0	18.2	19.0	18.6	20.0	23.4	20.8	20.2
California	14.8	13.0	12.4	11.3	10.3	13.0	10.9	11.2	10.8	9.3	17.1	15.0	14.6	14.0
Far Western	15.4	14.3	13.9	16.8	15.2	19.2	16.8	16.9	18.1	18.2	20.8	22.6	20.2	22.9
United States	11.9	12.3	12.7	13.5	12.3	15.0	14.5	12.9	12.5	14.5	15.5	14.0	14.0	15.8

WHEAT—Continued.

Average farm value per acre of wheat in the United States December 1.

State, Territory, or Division.	10-year averages. 1866–1875.	10-year averages. 1876–1885.	10-year averages. 1886–1895.	10-year averages. 1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	22.04	19.32	16.43	21.22	17.55	23.18	23.28	24.99	24.23	24.38	25.05	26.50	24.50	28.11
N. Hampshire	24.78	20.59	15.96	17.54	15.00	......	......	......	......	......	......	......	......	......
Vermont	26.18	21.34	18.05	20.14	18.33	17.58	20.49	19.85	28.36	16.92	19.18	23.00	23.00	30.00
Connecticut	25.11	20.46	16.74	18.02	17.05	......	......	......	......	......	......	......	......	......
New York	20.02	17.67	13.24	14.70	13.63	10.74	13.27	14.42	12.32	18.06	16.40	17.13	17.32	23.31
New Jersey	21.32	15.56	11.52	13.36	14.13	12.10	12.16	11.48	14.63	14.43	14.64	18.13	17.47	19.51
Pennsylvania	18.09	14.87	11.15	12.64	9.72	12.31	11.53	12.32	15.23	14.88	13.45	17.86	18.32	18.53
N. Atlantic	19.10	15.98	11.76	13.28	10.73	11.95	12.00	12.82	14.60	15.59	14.17	17.76	18.14	19.59
Delaware	15.37	14.25	9.68	12.80	14.21	13.13	12.38	7.96	16.09	11.32	11.36	19.88	15.00	14.56
Maryland	14.84	14.34	10.77	12.72	13.84	12.21	10.58	9.88	14.20	13.37	11.36	18.24	16.07	15.95
Virginia	10.87	8.90	7.04	8.34	8.57	7.96	4.59	7.31	11.12	10.03	10.12	12.25	11.51	12.88
W. Virginia	11.43	11.02	8.24	8.96	7.55	8.39	6.31	8.67	11.01	10.95	10.29	12.20	13.39	14.09
N. Carolina	9.79	7.39	5.46	6.82	7.87	7.13	4.88	4.95	10.23	6.83	8.46	10.16	10.70	12.06
S. Carolina	10.68	8.98	5.70	8.01	9.09	8.62	5.71	6.56	10.21	6.77	10.23	10.20	11.70	14.60
Georgia	10.49	8.56	5.92	7.90	8.64	7.71	5.88	5.95	11.09	7.38	10.20	10.35	11.13	14.50
S. Atlantic	12.09	9.90	7.44	8.91	9.65	8.93	6.86	7.49	11.82	9.86	10.22	13.93	12.81	14.06
Ohio	14.40	14.89	10.66	10.76	4.26	10.86	12.14	10.96	12.65	14.02	14.48	15.00	15.84	17.61
Indiana	12.21	13.34	9.73	9.39	3.71	11.06	10.88	7.80	9.75	15.01	14.49	12.67	16.27	16.83
Illinois	11.66	11.92	9.87	9.62	8.32	12.14	10.56	6.30	13.94	12.96	13.46	15.66	12.61	18.10
Michigan	16.21	15.94	10.95	10.63	5.24	7.88	12.21	11.94	10.58	14.61	9.43	13.19	17.46	21.06
Wisconsin	12.06	10.86	8.84	11.15	9.92	10.48	11.61	11.22	15.18	12.65	11.73	12.95	16.73	18.69
N. Central E. Miss. R.	13.11	13.32	10.11	10.17	6.06	10.70	11.38	9.00	12.27	14.00	13.44	13.94	15.21	17.93
Minnesota	9.04	10.11	8.77	8.78	6.62	7.74	8.48	9.04	11.14	9.44	7.08	11.96	12.03	16.13
Iowa	9.32	7.85	8.26	9.02	9.20	9.75	6.96	7.69	10.48	10.08	10.07	11.03	15.17	15.77
Missouri	13.18	9.92	8.19	8.66	7.88	10.97	11.54	6.18	11.23	9.80	9.92	11.09	9.30	15.43
North Dakota	......	......	7.10	7.56	2.84	7.07	9.22	8.00	9.56	9.66	8.19	8.70	10.67	12.60
South Dakota	......	......	5.50	6.77	4.00	6.84	6.95	8.56	7.58	9.18	8.17	9.97	11.78	12.69
Nebraska	10.06	8.33	6.05	9.09	6.36	9.23	10.23	8.47	11.83	12.81	12.54	14.31	14.47	16.74
Kansas	15.39	10.29	7.68	8.63	9.73	10.92	5.73	8.33	11.06	9.88	8.75	9.03	11.06	13.85
N. Central W. Miss. R.	10.34	9.33	7.70	8.29	6.70	8.63	8.34	8.23	10.38	9.94	8.69	10.44	11.47	14.30
Kentucky	10.58	9.22	8.18	8.74	8.97	8.71	6.88	6.80	12.43	9.83	10.29	11.04	11.37	13.10
Tennessee	9.01	6.40	6.22	7.88	7.82	7.99	5.47	5.96	12.77	6.55	9.75	9.02	9.90	11.96
Alabama	10.41	7.49	6.69	8.64	8.45	7.66	5.58	8.65	11.85	9.70	10.34	10.51	12.29	13.65
Mississippi	13.98	7.87	6.42	8.37	8.06	7.57	6.80	7.44	8.89	10.26	8.70	9.50	14.00	13.00
Texas	17.66	11.12	8.11	9.84	11.78	6.94	6.93	10.45	11.77	7.83	8.85	7.33	10.78	10.74
Oklahoma	......	......	5.70	9.31	10.07	10.07	6.60	9.24	11.35	5.98	7.66	7.47	10.21	12.93
Arkansas	13.49	7.24	6.79	6.92	6.57	6.86	6.10	5.46	10.20	7.11	8.10	9.03	9.50	12.54
S. Central	10.29	8.08	7.28	8.68	9.52	8.52	6.45	8.36	11.83	7.29	8.87	8.86	10.53	12.40
Montana	......	16.99	14.45	18.02	16.23	17.76	16.12	18.61	21.28	16.90	15.36	23.33	20.82	26.75
Wyoming	......	15.81	13.67	16.50	13.38	16.91	19.04	15.47	19.89	18.29	20.95	21.93	21.56	28.42
Colorado	......	17.76	13.25	15.48	13.33	16.15	13.50	17.56	22.75	17.50	21.13	22.62	18.48	27.41
New Mexico	......	15.23	12.05	14.90	14.28	15.48	14.71	13.80	13.57	19.98	20.75	22.33	23.51	28.66
Arizona	......	14.46	12.31	19.44	11.53	18.53	19.64	23.53	28.82	26.21	25.96	27.20	32.00	34.75
Utah	......	14.76	11.44	15.91	11.49	14.35	16.11	18.08	22.88	17.69	17.81	21.31	22.51	23.32
Nevada	34.99	19.37	13.40	22.02	17.15	22.09	25.56	27.32	24.10	20.79	26.77	33.27	33.91	29.83
Idaho	......	16.17	12.70	14.99	9.57	12.93	15.44	15.86	18.34	18.49	14.66	16.92	20.83	24.20
Washington	......	12.22	10.91	14.26	11.99	13.67	14.44	14.04	17.77	16.13	12.91	19.48	15.40	21.61
Oregon	16.25	14.52	11.02	12.14	7.59	11.37	13.37	13.98	15.37	12.68	13.26	18.29	17.48	18.80
California	16.72	13.00	8.80	8.59	5.97	7.80	8.72	9.74	9.50	7.63	12.82	14.70	14.89	15.54
Far Western	16.99	13.63	9.62	11.66	8.51	10.83	12.03	12.92	15.10	12.82	14.06	18.19	17.31	21.55
United States	12.92	11.39	8.67	9.37	7.61	9.37	9.14	8.96	11.58	10.83	10.37	12.26	12.97	15.62

WHEAT—Continued.

Average farm price of wheat per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900	1901	1902	1903	1904	1905	1906	1907	1908	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
Me	167	141	104	96	90	97	92	98	104	106	101	101	104	103	107	110	114	115	110
N. H	163	141	101	98	92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vt	154	127	96	95	78	94	109	95	113	90	86	100	99	115	100	140	137	115	120
Conn	146	124	104	91	82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. Y	142	114	86	84	77	82	79	81	109	86	82	99	99	100	112	124	116	107	111
N. J	146	117	86	83	74	72	76	82	110	88	80	98	101	101	116	136	123	108	109
Pa	136	111	82	80	72	72	73	79	108	87	76	96	99	100	114	127	117	104	109
N. Atlantic	139.4	113.3	83.4	81.5	73.3	74.2	74.7	79.8	108.3	86.9	77.7	96.7	99.1	100.1	113.7	126.8	117.1	105.1	109.5
Del	141	114	80	80	70	71	75	78	108	82	71	97	100	102	117	147	107	96	104
Md	140	112	81	80	71	71	72	79	106	82	71	96	98	100	116	135	109	102	110
Va	131	106	80	81	72	73	79	84	109	88	81	98	101	101	113	140	116	105	115
W. Va	111	102	80	83	77	77	82	85	109	89	81	100	103	103	113	124	121	112	113
N. C	136	112	88	91	82	82	92	97	119	102	93	107	107	113	124	130	125	120	127
S. C	178	136	100	104	101	98	102	101	126	111	110	120	130	120	129	139	135	135	146
Ga	152	124	97	100	95	94	98	96	126	107	102	115	121	122	129	137	139	136	145
S. Atlantic	135.8	111.2	82.7	84.1	77.5	77.1	80.2	85.4	112.1	89.6	82.7	97.2	104.4	105.3	117.9	135.0	117.8	110.0	119.5
Ohio	120	102	74	78	71	71	71	80	110	82	71	92	99	101	119	140	108	105	112
Ind	111	96	70	77	70	70	68	78	106	82	70	88	98	100	116	137	102	101	110
Ill	98	91	69	74	64	69	59	75	101	81	69	87	97	97	111	123	102	99	104
Mich	121	99	74	77	69	71	69	77	108	79	72	91	97	99	118	136	111	105	112
Wis	88	89	68	71	64	65	64	72	98	76	72	92	92	95	100	115	110	97	96
N. C. E. of Miss. River	106.6	95.8	71.2	76.5	66.6	69.8	66.5	77.4	104.7	80.9	70.3	88.1	97.7	99.3	115.4	133.8	104.9	102.4	108.2
Minn	67	79	64	66	63	60	61	69	87	71	65	92	94	97	105	120	115	90	96
Ia	74	77	64	64	59	60	55	62	90	71	64	82	88	89	100	110	102	89	93
Mo	103	87	64	71	63	69	58	71	96	79	67	84	93	95	110	130	102	100	105
N. Dak	.....	.....	49	62	58	54	58	63	81	69	63	87	92	94	103	117	111	85	92
S. Dak	.....	.....	50	61	58	53	57	62	79	67	61	89	92	93	98	115	110	85	90
Nebr	68	70	56	59	53	54	49	54	87	66	57	79	84	86	95	112	92	85	89
Kans	98	74	60	63	55	59	55	59	89	71	58	82	88	91	102	120	96	93	96
N. C. W. of Miss. River	78.9	78.4	59.2	63.8	58.0	57.9	56.7	62.4	86.4	70.0	61.4	85.6	90.3	92.7	101.9	118.2	104.7	88.7	94.1
Ky	115	95	73	78	69	72	74	81	109	87	73	92	98	101	120	131	109	104	111
Tenn	117	97	75	83	79	74	76	84	111	91	78	95	99	103	117	135	113	107	115
Ala	137	117	97	95	89	88	93	95	115	101	94	105	107	105	111	130	122	128	130
Miss	152	127	93	89	84	86	85	93	101	95	87	88	103	100	.....	.....	125	125	121
Tex	138	103	78	80	64	78	77	78	110	88	77	99	98	100	107	121	115	109	118
Okla	.....	.....	50	66	54	64	59	64	94	70	56	83	88	91	104	119	103	101	101
Ark	131	102	79	76	65	78	67	78	101	90	75	95	95	97	105	122	112	103	110
S. Cen.	119.7	98.5	75.0	75.5	64.8	70.4	69.2	73.3	103.9	82.8	69.2	91.3	94.9	97.7	110.3	124.9	109.3	104.3	109.2
Mont	.....	96	73	67	61	67	62	66	89	71	64	81	86	87	99	127	120	88	87
Wyo	.....	93	68	73	76	69	81	74	90	72	73	77	85	89	94	120	100	107	99
Colo	.....	93	69	67	59	67	75	66	91	70	65	78	88	89	114	126	125	91	93
N. Mex	.....	112	82	76	68	72	86	75	106	90	83	93	94	95	111	126	130	97	117
Ariz	.....	104	81	90	79	85	105	93	113	117	103	105	120	125	134	130	130	135	139
Utah	.....	82	65	68	55	70	76	80	86	67	65	74	85	85	109	120	110	89	90
Nev	162	107	77	85	70	88	98	99	92	77	85	104	113	117	135	165	150	136	104
Idaho	.....	94	69	63	46	61	70	75	80	66	60	67	74	78	96	112	107	75	87
Wash	.....	75	62	62	51	47	65	69	80	65	62	75	82	90	101	121	100	87	93
Oreg	86	83	66	66	55	54	67	77	81	68	66	78	84	95	102	115	105	87	93
Cal	113	100	71	76	58	60	80	87	88	82	75	98	102	101	113	127	116	108	111
Far West.	110.3	95.3	69.2	69.4	55.9	56.4	71.7	76.4	83.6	70.3	67.4	80.6	85.7	90.8	104.1	120.7	108.4	88.2	94.0
U. S.	108.6	92.6	68.3	69.4	61.9	62.4	63.0	69.5	92.4	74.8	66.7	87.4	92.8	95.2	107.0	123.5	107.1	94.6	99.0

WHEAT—Continued.

Wholesale prices of wheat per bushel, 1896–1909.

Date.	New York.		Baltimore.		Chicago.		Detroit.		St. Louis.		Minneapolis.		San Francisco.	
	No. 2 red winter.		Southern, No. 2 red.[a]		No. 1 northern spring.[b]		No. 2 red.		No. 2 red winter.		No. 1 northern.[c]		No. 1 California (per cwt.).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*		
1896	62	106⅞	51	96	54	82	57½	97	52½	92⅝	50	81½	$0.92½	$1.50
1897	81⅝	111¼	50	107½	64⅛	109	74½	101	65½	103	65¼	107½	1.21¼	1.56¼
1898	68¾	193½	60	146½	62	185	65½	160	64	127	55	155	1.08¾	1.80¾
1899	72⅛	87⅛	68½	81½	64	79½	67½	80½	68	81⅛	60	73⅞	.96¼	1.18¾
1900	72⅝	96⅞	70	90	61½	87½	66¾	91½	66¼	86½	62	88⅛	.90	1.07
1901	72¾	89⅞	69¼	85¾	63⅛	79½	66½	90½	61¼	88¼	60½	77½	.95	1.06¼
1902	73½	94¼	66¼	87½	67⅛	95	68½	93½	63	92¼	66½	80⅛	1.05	1.45
1903	78¼	99⅞	76½	88⅞	70¼	93	74¼	94	69¾	94	73⅛	100	1.32½	1.55
1904	92½	126¼	82	115½	81¼	122	92	123	84½	121	84¾	124½	1.23¾	1.50
1905	84⅝	125¾	73	119½	82½	124	80	124	82	120	75¼	124½	1.35	1.55
1906.														
January	89½	97	84	86¾	81¼	85¼	85	88	92	96	81	84⅛	......	......
February	90⅜	96½	84½	86¾	79¼	83½	84	86½	88	95⅝	78½	83¼	......	......
March	85	89¼	81	84¾	74½	79½	81	86	89	94	74⅞	78⅞	......	......
April	88¼	92¼	83	88¾	77½	83	85½	89	90	98	76⅝	81⅛	......	......
May	93	95	86¼	89½	80½	87¼	89¼	93½	88	99¼	78⅜	84¾	......	......
June	91⅞	97	87¼	91	81⅝	85¾	86	89¼	86	95	82⅛	85⅝	......	......
July	81	92⅜	75¾	81¾	75¾	84	74¾	85½	71¾	82	76⅛	82	......	......
August	77¼	81½	71	75	73⅝	77⅞	72¼	75	68⅛	72½	73¼	77½	......	......
September	77	81	68	74⅛	77	79	72	75¼	69	76	69⅝	78⅛	......	......
October	78⅛	83⅛	74	75⅜	d 71	d 73¾	74¾	78¼	74	77½	74½	77⅝	......	......
November	80½	84⅛	73½	75½	d 71⅝	d 74¼	77½	78½	74	76½	77⅛	82¼	......	......
December	80¼	83	73⅜	75	d 72⅝	d 75	76⅜	78¼	74	76½	77⅝	81⅜	......	......
Year	77	97	68	91	71	87¼	72	93½	68⅛	99¼	69⅝	85⅛	......	......
1907.														
January	80	84	74	78½	......	......	75	78¼	74½	79¼	76¾	83⅝	1.22½	1.40
February	83	85¾	77½	81	82	87	77	79¼	76½	80	79¾	85⅛	1.25	1.35
March	80¾	85	75¾	77½	79	86½	76	78¼	75½	79	78½	81½	1.25	1.40
April	82½	91	77½	84	80	87	77¼	82½	75½	81½	79⅝	86⅛	1.27½	1.50
May	87	108⅞	84	99½	84	106	81	103	80½	101	87	105⅛	1.35	1.55
June	94⅜	104⅜	90¼	96½	98	105	93	99¼	90½	100	96⅞	104⅜	1.42½	1.55
July	96⅝	105⅜	89⅜	96	100	106½	91¼	99	87½	96½	98	105¼	1.50	1.60
August	91	100⅝	85⅞	94½	93	105	83½	92¼	81	91	94¾	105⅛	1.50	1.60
September	100⅛	108¼	96⅝	104¼	105	112	92¼	99	89½	101¼	104⅛	111⅛	1.55	1.70½
October	104¾	116¼	99¾	111¼	108	122	97¾	106½	96	109½	103¼	119¾	1.60	1.77
November	94¾	108½	97¼	102½	......	......	94¼	100¼	90	99	98	107⅛	1.65	1.80½
December	104½	109	97½	104¼	......	......	97¾	104¼	96	105	103¼	111½	1.60	1.77
Year	80	116¼	74	111¼	79	122	75	106½	74½	109½	76¾	119¾	1.22½	1.80
1908.														
January	100	109½	94¾	104	......	......	95¼	105	99	106¼	105⅝	114½	1.60	1.72½
February	96⅝	104⅜	92	100½	......	......	94½	103½	96	104	101⅞	110⅜	1.55	1.70
March	99¾	106¼	95½	99¾	105	108	94¾	103¾	97	106	103¼	111½	1.60	1.70
April	96⅝	109½	93¾	100½	105	107	92½	101½	96	102	98¾	108	1.60	1.70
May	103	111½	97½	103	......	......	97	104	100	106	106⅛	111⅞	1.63¾	1.75
June	95¾	103	89	99	107	112	89¾	97	89	101½	105⅝	110⅞	1.60	1.72½
July	96⅝	102¾	91	99	115	119	90	92½	89	93½	107¾	121	1.60	1.70
August	99⅝	105½	96	99⅝	108	124	93½	96	91½	97½	99⅞	125	1.65	1.72½
September	102¼	110¼	96⅞	104¼	105	109	96	101¾	97	106	100⅞	105⅜	1.65	1.77½
October	106½	110⅝	101⅛	103½	102	108	100	103	100½	106½	102⅛	105	1.62½	1.75
November	109¼	114½	101¼	105⅜	104	110	102	106	101¾	109	104⅛	108⅜	1.65	1.72½
December	107⅝	115	101½	106⅜	106½	112	102½	107	106	110	106⅛	112½	1.65	1.72½
Year	95¾	115	89	106⅜	102	124	89¾	107	89	110	98¾	125	1.55	1.77½
1909.														
January	105¾	109¾	103¾	108¾	107	111½	104¾	108¼	107	115	107⅞	111¼	1.70	1.75
February	110⅜	126⅜	108¾	128	110½	121	108¼	125	114	130	110	116½	1.72½	1.95
March	121¼	128⅝	122½	128¼	113⅝	121½	120	130	126	138	112⅜	117⅜	1.85	2.05
April	127½	140	130	145	119	131¼	130	141	135	152½	118⅜	129¼	1.97½	2.15
May	141	147	145	150¾	126½	137	141	155	148	160	127⅛	135¼	2.10	2.15
June	147	151	152	160	129	136	143	157	128	166	128¾	138⅛	2.10	2.15
July	141	149	112	122	126½	140	107	140	105½	150	123	135	2.05	2.15
August	104	118	99½	112	104½	136	105½	109	102	111	97⅝	144½	1.75	2.00
September	105⅞	115	100	113	104	107	107	108	105	122	97½	101⅞	1.65	1.80
October	118	128½	113⅞	119¾	103	109¾	117½	127	116	129	99¼	106⅝	1.65	2.00
November	123½	127	114	118	103¼	112	117¾	122½	114	127	101⅛	107¾	1.80	1.90
December	124	128½	116½	122	106	119¾	119½	126	116	132	105½	115⅛	1.95	2.00
Year	104	151	99½	160	103	140	104⅝	157	102	166	97½	144½	1.65	2.51

[a] Southern for 1896.
[b] No. 2 spring, for 1896; no grade, 1897 to 1901.
[c] No. 2 northern, 1896 to 1900.
[d] No. 2 red winter.

WHEAT—Continued.

Average farm price of wheat per bushel, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	93.5	88.7	90.1	97.2	103.8	101.2	97.2	91.7	91.5	88.2	96.5	91.4	86.7	77.6
February	95.2	.....	100.1	.....	105.3	.....	99.3	.....	92.7	.....	97.7	.....	90.8	.....
March	103.9	89.2	109.5	96.3	114.4	99.6	111.3	90.8	99.9	88.2	103.3	93.8	101.2	81.6
April	107.0	89.8	113.7	97.0	117.9	100.2	115.4	92.3	101.9	89.3	110.3	93.9	104.1	80.0
May	115.9	89.3	121.9	96.8	124.8	101.5	124.4	91.3	110.9	88.7	120.8	93.6	113.1	79.7
June	123.5	92.3	126.8	97.7	135.0	104.0	133.8	92.3	118.2	90.7	124.9	95.3	120.7	87.8
July	120.8	89.5	129.7	95.7	130.4	100.1	129.4	86.3	115.8	89.0	122.2	91.1	118.3	86.8
August	107.1	90.4	117.1	94.4	117.8	99.2	104.9	85.8	104.7	91.3	109.3	87.8	108.4	87.4
September	95.2	88.7	102.6	92.7	112.5	100.5	98.4	88.5	89.9	87.3	102.2	89.6	95.3	86.1
October	94.6	90.4	105.1	94.8	110.0	104.4	102.4	93.3	88.7	87.8	104.3	92.5	88.2	86.4
November	99.9	91.5	108.4	96.5	117.8	104.8	108.8	94.6	93.7	88.7	110.3	94.4	92.0	88.7
December	99.0	92.8	109.5	99.1	119.5	104.4	108.2	97.7	94.1	90.3	109.2	94.9	94.0	85.7

International trade in wheat, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Argentina	Jan 1	84,684,087	105,391,256	82,599,397	98,502,584	133,610,896
Australia	Jan. 1	34,113,906	25,424,969	30,262,335	28,784,130	15,027,386
Austria-Hungary	Jan. 1	117,282	49,321	1,118,588	683,014	14,720
Belgium	Jan. 1	14,803,681	14,639,453	16,051,913	17,852,194	24,178,475
British India	Jan. 1	75,256,004	47,680,406	26,488,483	37,515,771	4,289,344
Bulgaria	Jan. 1	19,240,949	16,542,617	9,856,087	8,845,502	7,818,338
Canada	Jan. 1	16,618,309	28,669,571	38,135,023	37,503,057	52,502,903
Chile	Jan. 1	2,718,470	294,656	8,065	1,297,765	[b] 4,946,419
Germany [c]	Jan. 1	5,864,239	6,050,111	7,365,175	3,520,763	9,594,177
Netherlands	Jan. 1	40,681,553	53,052,451	33,126,858	44,717,615	29,914,096
Roumania	Jan. 1	26,107,148	63,066,299	63,485,127	42,307,592	[b] 26,247,384
Russia	Jan. 1	169,058,193	176,852,636	132,410,638	85,270,647	[b] 53,928,000
Servia	Jan. 1	3,056,539	3,422,554	3,365,644	1,992,514	3,319,526
United States	Jan. 1	13,015,277	20,738,635	62,850,984	91,383,648	92,779,509
Other countries	....	5,294,161	5,706,970	6,038,597	10,600,009	[b] 10,379,838
Total	....	510,629,798	567,581,905	513,163,514	510,776,805	468,551,011

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	8,057,794	3,974,199	1,216,790	87,535	290,334
Belgium	Jan. 1	63,979,307	64,789,991	67,928,168	67,409,371	67,032,575
Brazil	Jan. 1	7,112,130	7,873,510	8,511,259	9,070,298	9,551,415
Denmark	Jan. 1	3,861,670	3,447,367	4,168,334	2,820,299	3,593,773
France	Jan. 1	7,580,618	6,713,342	11,288,433	13,131,250	2,752,415
Germany [c]	Jan. 1	74,263,743	84,054,403	73,784,363	90,200,107	76,814,333
Greece	Jan. 1	5,132,775	5,733,503	7,426,048	7,454,387	6,638,757
Italy	Jan. 1	29,617,847	43,047,890	50,473,571	34,281,799	29,026,788
Japan	Jan. 1	888,558	2,281,022	789,540	2,008,998	1,319,524
Netherlands	Jan. 1	50,510,097	61,992,589	44,506,710	53,704,405	40,159,483
Portugal	Jan. 1	3,282,298	4,672,573	3,853,239	962,467	4,604,041
Spain	Jan. 1	8,192,327	32,517,661	19,312,985	4,290,674	[b] 2,902,246
Sweden	Jan. 1	8,082,561	7,255,222	7,838,974	5,656,901	7,599,884
Switzerland	Jan. 1	17,220,343	16,158,553	16,196,009	17,211,359	12,140,012
United Kingdom	Jan. 1	181,984,062	181,579,837	172,808,565	180,443,017	168,629,046
Other countries	....	11,475,686	14,032,454	18,299,933	15,260,252	[b] 10,778,106
Total	....	481,241,816	540,124,116	508,402,921	504,053,119	443,832,729

[a] See "General note," p. 442.
[b] Preliminary.
[c] Not including free ports prior to March 1, 1906.

WHEAT—Continued.

International trade in wheat flour, 1904-1908.[a]

EXPORTS.

Country.	Year beginning -	1904.	1905	1906.	1907.	1908.
		Barrels.	*Barrels*	*Barrels*	*Barrels.*	*Barrels.*
Argentina	Jan. 1	1,206,896	1,628,271	1,450,979	1,434,118	1,276,656
Australia	Jan. 1	1,052,500	1,573,663	1,702,801	1,667,722	1,191,861
Austria-Hungary	Jan. 1	859,446	795,853	658,449	658,555	408,453
Belgium	Jan. 1	758,648	857,017	439,659	442,303	529,660
British India	Jan. 1	574,379	577,961	417,984	476,995	350,407
Bulgaria	Jan. 1	232,315	214,587	261,974	293,500	287,042
Canada	Jan. 1	1,399,555	1,278,770	1,516,170	1,858,483	1,747,163
Chile	Jan. 1	95,099	91,617	50,908	42,207	[b] 19,647
France	Jan. 1	190,352	336,530	344,996	299,247	365,496
Germany [c]	Jan. 1	616,939	991,701	663,437	987,604	1,702,862
Italy	Jan. 1	269,512	322,004	355,934	510,538	409,259
Netherlands	Jan. 1	130,372	199,777	110,985	159,970	145,451
Roumania	Jan. 1	135,900	484,511	745,296	556,898	[d] 556,898
Russia	Jan. 1	1,172,442	1,090,480	1,131,591	744,832	[b] 539,297
Servia	Jan. 1	9,286	21,794	86,885	33,570	62,998
United Kingdom	Jan 1	375,473	603,710	599,560	692,366	988,326
United States	Jan. 1	11,542,618	11,344,432	14,324,100	15,276,506	13,013,025
Other countries		422,696	384,261	282,193	560,528	[b] 785,430
Total		21,044,428	22,796,939	25,143,001	26,695,951	24,469,940

IMPORTS.

Country.	Year beginning -	1904.	1905	1906.	1907.	1908.
Belgium	Jan. 1	40,255	41,516	55,601	48,735	31,735
Brazil	Jan. 1	1,474,049	1,579,954	1,731,596	1,915,018	1,699,314
China	Jan. 1	654,307	633,851	1,214,069	3,002,982	1,104,514
Cuba	Jan. 1	645,736	764,024	735,950	861,865	[d] 861,865
Denmark	Jan 1	335,896	276,489	328,972	384,268	441,515
Egypt	Jan. 1	886,729	1,365,764	1,684,257	1,582,387	1,919,766
Finland	Jan. 1	757,085	794,748	879,955	963,974	1,022,029
France	Jan. 1	232,150	140,854	98,572	197,245	81,824
Germany [c]	Jan. 1	260,600	240,560	242,116	221,301	190,882
Greece	Jan. 1	16,584	28,942	110,867	60,923	24,953
Italy	Jan. 1	11,700	12,513	15,043	18,605	18,021
Japan	Jan. 1	1,291,886	1,242,854	1,082,671	838,641	352,537
Netherlands	Jan. 1	1,868,040	1,863,924	2,260,321	1,908,957	2,200,426
Newfoundland	July 1	391,937	371,407	411,781	366,237	366,237
Norway	Jan. 1	402,865	430,956	472,995	564,617	032,712
Philippine Islands	Jan. 1	182,166	176,580	231,301	266,644	231,305
Spain	Jan. 1	13,694	663,272	161,765	695	[b] 171
Sweden	Jan. 1	80,852	57,839	83,949	125,421	120,137
Trinidad and Tobago	April 1	168,513	207,922	237,668	226,291	230,994
United Kingdom	Jan. 1	8,384,319	6,779,921	8,024,846	7,565,526	7,358,072
Other countries		2,553,765	3,617,003	4,056,874	4,415,503	[b] 4,569,267
Total		20,653,128	21,290,893	24,121,169	25,535,835	23,548,276

[a] See "General note," p. 442.
[b] Preliminary.
[c] Not including free ports prior to March 1, 1906.
[d] Year preceding.

WHEAT—Continued.

International trade in wheat, including wheat flour, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Argentina	Jan. 1	90,115,119	112,718,476	89,128,803	104,956,115	139,355,848
Australia	Jan. 1	38,850,166	32,506,453	37,924,939	36,288,879	20,390,760
Austria-Hungary	Jan. 1	3,984,789	3,630,659	4,081,608	3,646,512	1,852,758
Belgium	Jan. 1	18,217,597	18,496,029	18,030,379	19,842,558	26,561,945
British India	Jan. 1	77,840,710	50,281,230	28,369,411	39,662,249	5,866,176
Bulgaria	Jan. 1	20,286,368	17,508,259	11,035,570	10,166,292	9,110,027
Canada	Jan. 1	22,916,307	34,424,036	44,957,788	45,866,231	60,365,137
Chile	Jan. 1	3,146,416	706,932	233,101	1,487,697	5,034,831
France	Jan. 1	874,956	1,553,389	1,639,164	1,394,463	1,863,508
Germany[b]	Jan. 1	8,640,465	10,512,765	10,350,641	7,964,981	17,257,056
Italy	Jan. 1	1,226,179	1,465,332	1,616,547	2,369,916	2,271,395
Netherlands	Jan. 1	41,268,227	53,951,447	33,626,290	45,437,480	30,568,626
Roumania	Jan. 1	26,718,698	65,246,599	66,838,959	44,813,633	[c] 28,753,425
Russia	Jan. 1	174,334,182	181,759,796	137,502,798	88,622,391	[c] 56,354,836
Servia	Jan. 1	3,098,326	3,520,627	3,756,626	2,143,579	3,603,017
United Kingdom	Jan. 1	1,773,148	2,803,381	2,792,173	3,600,114	5,026,976
United States	Jan. 1	64,957,058	71,788,579	127,309,434	160,127,925	151,338,121
Other countries	....	7,081,013	7,294,141	7,112,787	12,517,571	[c] 13,091,300
Total	....	605,329,724	670,168,130	626,307,018	630,908,586	578,665,742

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	8,057,794	3,974,199	1,255,868	130,321	332,931
Belgium	Jan. 1	64,160,454	64,976,813	68,178,372	67,688,679	67,175,383
Brazil	Jan. 1	13,745,351	14,983,303	16,303,441	17,687,879	17,198,328
China	Jan. 1	2,944,382	2,852,330	5,463,370	13,513,419	5,375,313
Cuba	Jan. 1	2,905,812	3,438,108	3,311,775	3,878,392	[d] 3,878,392
Denmark	Jan. 1	5,373,202	4,691,567	5,648,708	4,549,505	5,580,591
Egypt	Jan. 1	4,353,796	7,247,951	8,293,376	7,701,728	9,280,247
Finland	Jan. 1	3,413,761	3,580,581	3,966,878	4,397,732	4,612,775
France	Jan. 1	8,625,293	7,347,185	11,732,007	14,018,852	3,120,623
Germany[b]	Jan. 1	75,436,443	85,136,923	74,873,885	91,195,961	77,673,302
Greece	Jan. 1	5,207,403	5,863,742	7,924,950	7,728,541	6,751,045
Italy	Jan. 1	29,670,497	43,104,199	50,541,265	34,365,521	29,107,882
Japan	Jan. 1	6,702,045	7,873,865	5,661,560	5,782,882	2,905,940
Netherlands	Jan. 1	58,916,277	70,380,247	54,678,154	62,294,711	50,061,400
Newfoundland	July 1	1,763,716	1,671,332	1,853,014	1,648,066	[d] 1,648,066
Norway	Jan. 1	2,677,803	2,670,577	2,894,356	3,092,015	3,675,974
Philippine Islands	Jan. 1	819,848	794,672	1,040,854	1,199,898	1,040,872
Portugal	Jan. 1	3,282,298	4,672,573	3,853,239	962,467	4,604,041
Spain	Jan. 1	8,253,950	35,502,385	20,040,927	4,293,602	[c] 2,903,016
Sweden	Jan. 1	8,446,395	7,515,498	8,216,744	6,221,295	8,140,497
Switzerland	Jan. 1	17,220,343	16,158,553	16,196,009	17,211,359	12,140,012
Trinidad and Tobago	Apr. 1	758,308	935,649	1,069,506	1,018,310	1,039,473
United Kingdom	Jan. 1	219,713,497	212,089,481	208,920,372	214,487,884	201,740,370
Other countries	....	21,732,224	28,471,400	35,029,552	33,895,156	[c] 29,813,498
Total	....	574,180,892	635,933,133	616,948,182	618,964,375	549,799,971

[a] "General note," p. 442.
[b] Not including free ports prior to March 1, 1906.
[c] Preliminary.
[d] Year preceding.

OATS.

Oat area of countries named, 1905-1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Acres*	*Acres.*
United States	28,046,700	30,958,800	31,837,000	32,344,000	33,204,000
Canada:					
New Brunswick	187,100	194,600	194,200	203,900	207,200
Ontario	2,668,400	2,716,700	2,932,500	3,108,400	3,142,200
Manitoba	1,031,200	1,156,000	1,213,600	1,322,800	1,390,000
Saskatchewan	449,900	639,900	801,800	930,100	1,847,000
Alberta	242,800	335,700	307,100	549,400	820,000
Other	(a)	(a)	1,786,900	1,826,500	1,896,200
Total Canada	....	....	7,236,100	7,941,100	9,302,600
Mexico	(a)	(a)	(a)	(a)	(a)
EUROPE.					
Austria-Hungary:					
Austria	4,467,600	4,531,100	4,783,200	4,495,600	4,574,400
Hungary proper	2,512,700	2,562,800	2,653,100	2,612,500	2,695,200
Croatia-Slavonia	246,600	250,900	248,700	246,800	246,900
Bosnia-Herzegovina	(a)	271,700	215,500	220,700	207,100
Total Austria-Hungary	....	7,616,500	7,900,500	7,575,600	7,723,600
Belgium	586,500	645,500	613,900	622,700	(a)
Bulgaria	420,200	468,500	468,900	562,700	(a)
Denmark	1,016,300	1,006,100	996,000	996,000	988,400
Finland	(a)	(a)	(a)	(a)	(a)
France	9,420,100	9,525,600	9,565,300	9,628,800	9,652,200
Germany	10,334,000	10,431,600	10,816,000	10,564,400	10,650,100
Italy	(a)	(a)	(a)	(a)	(a)
Netherlands	325,800	343,800	344,200	345,500	(a)
Norway	(a)	(a)	264,300	272,100	270,200
Roumania	921,000	943,700	871,000	1,211,600	1,197,200
Russia:					
Russia proper	38,605,700	38,211,800	37,964,500	37,697,900	(b)
Poland	2,716,900	2,779,700	2,829,100	2,794,900	(b)
Northern Caucasia	847,100	969,000	981,500	1,107,100	(b)
Total Russia (European)	42,169,700	41,960,500	41,775,100	41,599,900	....
Servia	258,200	261,500	237,500	249,500	(a)
Spain	1,119,400	1,192,200	1,186,500	1,210,600	1,227,200
Sweden	2,030,800	2,007,900	2,002,800	(a)	(a)
United Kingdom:					
Great Britain—					
England	1,880,500	1,881,100	1,967,700	1,958,700	1,839,900
Scotland	963,000	956,800	951,000	948,500	943,400
Wales	207,900	205,100	203,900	201,600	198,500
Ireland	1,066,800	1,076,300	1,075,400	1,060,300	1,035,800
Total United Kingdom	4,118,200	4,119,300	4,198,000	4,169,100	4,017,600
ASIA.					
Cyprus	(a)	(a)	(a)	(a)	(a)
Russia:					
Central Asia	487,800	436,700	615,900	715,900	(b)
Siberia	2,604,800	2,966,100	3,113,500	3,343,500	(b)
Transcaucasia	1,600	1,900	1,300	1,200	(b)
Total Russia (Asiatic)	3,094,200	3,404,700	3,730,700	4,060,600	....
AFRICA.					
Algeria	311,100	316,700	340,700	334,700	361,400
Cape of Good Hope	(a)	(a)	(a)	(a)	(a)
Natal	2,000	1,000	500	600	(a)
Tunis	(a)	84,000	91,400	93,900	(a)
AUSTRALASIA.					
Australia:					
Queensland	800	500	1,200	700	1,800
New South Wales	40,500	38,500	56,500	75,800	59,900
Victoria	344,000	312,100	380,500	398,700	419,900
South Australia	50,600	56,900	57,000	66,300	78,500
Western Australia	13,900	15,700	28,400	46,700	59,400
Tasmania	43,700	42,800	58,300	54,600	(a)
New Zealand	342,200	360,600	372,900	386,900	406,900
Total Australasia	835,500	827,100	954,800	1,029,700	....

[a] No official statistics of area; estimates of production on p. 458.
[b] No detailed official statistics of either area or production.

OATS—Continued.

Oat crop of countries named, 1905–1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	953,216,000	964,905,000	754,443,000	807,156,000	1,007,353,000
Canada:					
New Brunswick	5,829,000	6,052,000	6,107,000	5,373,000	6,136,000
Ontario	112,161,000	115,113,000	88,745,000	110,310,000	116,017,000
Manitoba	48,327,000	53,861,000	44,775,000	47,506,000	58,721,000
Saskatchewan	20,414,000	25,463,000	24,783,000	31,030,000	97,533,000
Alberta	10,109,000	13,958,000	9,826,000	24,227,000	40,775,000
Other	45,688,000	45,687,000	54,981,000	47,580,000	56,376,000
Total Canada	242,528,000	260,134,000	229,217,000	266,026,000	375,558,000
Mexico	17,000	17,000	17,000	17,000	17,000
Total	1,195,761,000	1,225,056,000	983,677,000	1,073,199,000	1,382,928,000
EUROPE.					
Austria-Hungary:					
Austria	123,880,000	154,551,000	170,605,000	144,069,000	171,940,000
Hungary proper	78,009,000	87,733,000	79,484,000	70,168,000	92,270,000
Croatia-Slavonia	6,075,000	5,541,000	4,174,000	4,253,000	5,607,000
Bosnia-Herzegovina	2,935,000	3,543,000	2,575,000	3,572,000	4,575,000
Total Austria-Hungary	210,899,000	251,368,000	256,838,000	222,062,000	274,392,000
Belgium	33,786,000	45,228,000	45,937,000	42,232,000	40,000,000
Bulgaria	9,381,000	11,884,000	7,416,000	11,252,000	12,000,000
Denmark	31,763,000	38,726,000	42,529,000	40,437,000	39,000,000
Finland	18,060,000	19,614,000	18,000,000	19,000,000	18,000,000
France	269,581,000	256,943,000	303,889,000	285,837,000	339,743,000
Germany	451,017,000	580,875,000	630,324,000	530,131,000	628,718,000
Italy	16,000,000	18,000,000	20,000,000	17,000,000	16,000,000
Netherlands	16,045,000	19,588,000	20,933,000	19,683,000	19,000,000
Norway	9,868,000	9,297,000	6,946,000	13,449,000	10,339,000
Roumania	18,974,000	26,165,000	17,842,000	17,212,000	25,945,000
Russia:					
Russia proper	767,550,000	544,933,000	729,813,000	743,523,000	....
Poland	61,933,000	66,425,000	72,574,000	66,135,000	....
Northern Caucasia	22,184,000	21,933,000	19,697,000	24,860,000	....
Total Russia (European)	851,667,000	633,291,000	822,084,000	834,518,000	1,067,668,000
Servia	3,549,000	4,642,000	2,984,000	3,057,000	3,000,000
Spain	22,250,000	28,077,000	16,998,000	28,114,000	34,307,000
Sweden	58,488,000	64,550,000	64,597,000	72,773,000	69,292,000
United Kingdom:					
Great Britain—					
England	76,453,000	84,102,000	94,606,000	82,470,000	80,711,000
Scotland	36,390,000	35,108,000	36,193,000	37,920,000	39,096,000
Wales	7,264,000	8,063,000	7,829,000	7,133,000	7,254,000
Ireland	51,420,000	53,111,000	50,850,000	54,032,000	57,467,000
Total United Kingdom	171,527,000	180,384,000	189,478,000	181,555,000	184,528,000
Total	2,192,855,000	2,188,632,000	2,466,795,000	2,338,312,000	2,781,932,000
ASIA.					
Cyprus	402,000	359,000	331,000	410,000	400,000
Russia:					
Central Asia	14,279,000	9,805,000	18,049,000	17,371,000	....
Siberia	70,673,000	69,873,000	67,114,000	89,500,000	....
Transcaucasia	44,000	35,000	13,000	27,000	....
Total Russia (Asiatic)	84,996,000	79,713,000	85,176,000	106,898,000	77,705,000
Total	85,398,000	80,072,000	85,507,000	107,308,000	78,105,000
AFRICA.					
Algeria	7,036,000	9,379,000	10,651,000	8,500,000	10,673,000
Cape of Good Hope	3,000,000	3,000,000	3,000,000	2,596,000	4,063,000
Natal	9,000	7,000	5,000	6,000	7,000
Tunis	2,032,000	2,411,000	3,149,000	1,786,000	2,000,000
Total	12,077,000	14,797,000	16,805,000	12,838,000	16,743,000

OATS—Continued.

Oat crop of countries named, 1905–1909—Continued.

Country.	1905.	1906.	1907	1908	1909.
AUSTRALASIA.					
Australia:	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Queensland	16,000	6,000	30,000	10,000	40,000
New South Wales	673,000	911,000	1,449,000	879,000	1,154,000
Victoria	6,353,000	7,460,000	9,124,000	5,365,000	11,475,000
South Australia	573,000	897,000	924,000	902,000	1,320,000
Western Australia	233,000	293,000	472,000	745,000	765,000
Tasmania	1,216,000	1,238,000	2,042,000	1,574,000	1,900,000
Total Australia	9,064,000	10,805,000	14,041,000	9,475,000	16,654,000
New Zealand	15,012,000	13,108,000	11,555,000	15,495,000	19,503,000
Total Australasia	24,076,000	23,913,000	25,596,000	24,970,000	36,157,000
Grand total	3,510,167,000	3,532,470,000	3,578,380,000	3,556,627,000	4,295,865,000

Condition of the oat crop in the United States on the first of months named, 1889–1909.

Year.	June.	July.	August.	When harvested.	Year.	June.	July.	August.	When harvested.	Year.	June.	July.	August.	When harvested.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1889	93.8	94.1	92.3	90.0	1896	98.8	96.3	77.3	74.0	1903	85.5	84.3	79.5	75.7
1890	89.8	81.6	70.1	64.4	1897	89.0	87.5	86.0	84.6	1904	89.2	89.8	86.6	85.6
1891	85.1	87.6	89.5	90.7	1898	98.0	92.8	84.2	79.0	1905	92.9	92.1	90.8	90.3
1892	88.5	87.2	86.2	78.9	1899	88.7	90.0	90.8	87.2	1906	85.9	84.0	82.8	81.9
1893	88.9	88.8	78.3	74.9	1900	91.7	85.5	85.0	82.9	1907	81.6	81.0	75.6	65.5
1894	87.0	77.7	76.5	77.8	1901	85.3	83.7	73.6	72.1	1908	92.9	85.7	76.8	69.7
1895	84.3	83.2	84.5	86.0	1902	90.6	92.1	89.4	87.2	1909	88.7	88.3	85.5	83.8

Average yield of oats in countries named, bushels per acre, 1889–1908.

Year.	United States.	Russia, European.[b]	Germany.[b]	Austria.[b]	Hungary proper.[b]	France.[a]	United Kingdom.[a]
Average (1889–1898)	25.5	16.9	38.3	24.2	......	29.6	43.5
1899	30.2	23.1	48.0	30.2	33.3	27.8	44.2
1900	29.6	20.0	48.0	25.2	28.1	25.7	43.5
1901	25.8	14.4	44.6	25.6	28.1	23.5	42.9
1902	34.5	21.8	50.1	27.7	34.0	29.2	48.3
1903	28.4	17.7	51.2	28.3	34.5	31.6	44.2
1904	32.1	25.7	46.2	24.3	25.6	27.2	44.2
1905	34.0	20.2	43.6	27.7	31.1	28.6	43.9
1906	31.2	15.1	55.7	34.1	34.3	27.0	46.1
1907	23.7	19.7	58.2	35.7	29.7	31.8	45.1
1908	25.0	20.0	50.2	32.1	26.8	34.6	42.2
Average (1899–1908)	29.3	19.7	49.6	29.1	30.8	31.3	44.6

[a] Winchester bushels. [b] Bushels of 32 pounds. [c] Average 1898–1907.

OATS—Continued.

Acreage, production, value, prices, exports, etc., of oats in the United States, 1849–1909.

Year.	Acreage sown and harvested.	Average yield per acre.	Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.	Chicago cash price per bushel, No. 2. December. Low.	December. High.	May of following year. Low.	May of following year. High.	Domestic exports, including oatmeal, fiscal year beginning July 1.[a]	Imports during fiscal year beginning July 1.[b]
	Acres.	Bush.	Bushels.	Cts.	Dollars.	Cts.	Cts.	Cts.	Cts.	Bushels.	Bushels.
1849[c]			146,584,000								
1859[c]			172,643,000								
1866	8,864,000	30.2	268,141,000	35.1	94,058,000	36	43	59	78	825,895	778,198
1867	10,746,000	25.9	278,698,000	44.5	123,903,000	52	57¼			122,554	780,798
1868	9,666,000	26.4	254,961,000	41.7	106,356,000	43	49½	56¾	62½	481,871	326,659
1869	9,461,000	30.5	288,334,000	38.0	109,522,000	40	44¾	46½	53½	121,517	2,266,785
1870	8,792,000	28.1	247,277,000	39.0	96,444,000	37¾	41	47¼	51	147,572	599,514
1871	8,366,000	30.6	255,743,000	36.2	92,591,000	30¼	33	34¾	42½	262,975	535,250
1872	9,001,000	30.2	271,747,000	29.9	81,304,000	23½	25¾	30	34	714,072	225,555
1873	9,752,000	27.7	270,340,000	34.6	93,474,000	34	40⅝	44	48½	812,873	191,802
1874	10,897,000	22.1	240,369,000	47.1	113,134,000	51¾	54½	57¼	64½	504,770	1,500,040
1875	11,915,000	29.7	354,318,000	32.0	113,441,000	29½	30⅞	28⅜	31½	1,466,228	121,547
1876	13,359,000	24.0	320,884,000	32.4	103,845,000	31¾	34½	37¼	45¾	2,854,128	41,597
1877	12,826,000	31.7	406,394,000	28.4	115,546,000	24⅛	27	23	27	3,715,479	21,391
1878	13,176,000	31.4	413,579,000	24.6	101,752,000	19⅝	20⅜	24⅜	30½	5,452,136	13,395
1879	12,684,000	28.7	363,761,000	33.1	120,533,000	32¾	36¾	29½	34⅞	766,366	489,576
1880	16,188,000	25.8	417,885,000	36.0	150,244,000	29⅛	33½	36¼	39½	402,904	64,412
1881	16,832,000	24.7	416,481,000	46.4	193,199,000	43½	46⅝	48¾	56⅝	625,690	1,850,983
1882	18,495,000	26.4	488,251,000	37.5	182,978,000	34¾	41⅛	38¼	42¾	461,496	815,017
1883	20,325,000	28.1	571,302,000	32.7	187,040,000	29⅝	36⅛	30¾	34¼	3,274,622	121,069
1884	21,301,000	27.4	583,628,000	27.7	161,528,000	22½	25¼	34½	37	6,203,104	94,310
1885	22,784,000	27.6	629,409,000	28.5	179,632,000	27	29	26¼	29⅝	7,311,306	149,480
1886	23,658,000	26.4	624,134,000	29.8	186,138,000	25¾	27⅛	25⅛	27½	1,374,635	139,575
1887	25,921,000	25.4	659,618,000	30.4	200,700,000	28⅝	30⅞	32⅛	38	573,080	123,817
1888	26,998,000	26.0	701,735,000	27.8	195,424,000	25	26⅜	21⅝	23⅝	1,191,471	131,501
1889	27,462,000	27.4	751,515,000	22.9	171,781,000	20	21	24¾	30	15,107,238	153,232
1890	26,431,000	19.8	523,621,000	42.4	222,048,000	39⅞	43⅞	45¼	54	1,382,836	41,848
1891	25,582,000	28.9	738,394,000	31.5	232,312,000	31⅛	33⅝	28⅝	33½	10,586,644	47,782
1892	27,064,000	24.4	661,035,000	31.7	209,254,000	25⅝	31¼	28⅞	32¼	2,700,793	49,433
1893	27,273,000	23.4	638,855,000	29.4	187,576,000	27⅛	29⅞	32⅛	36	6,290,229	31,759
1894	27,024,000	24.5	662,037,000	32.4	214,817,000	28¼	29⅝	27½	30¼	1,708,824	330,318
1895	27,878,000	29.6	824,444,000	19.9	163,655,000	16⅞	17½	18	19⅝	15,156,618	66,602
1896	27,566,000	25.7	707,346,000	18.7	132,485,000	16½	18⅝	16⅞	18¾	37,725,083	131,204
1897	25,730,000	27.2	698,768,000	21.2	147,975,000	21	23⅝	26	32	73,880,307	25,093
1898	25,777,000	28.4	730,907,000	25.5	186,405,000	26	27¾	24	27¾	33,534,362	28,098
1899	26,341,000	30.2	796,178,000	24.9	198,168,000	22¼	23	21¼	23¾	45,048,857	54,576
1900	27,365,000	29.6	809,126,000	25.8	208,669,000	21¾	22¾	27⅞	31	42,268,931	32,107
1901	28,541,000	25.8	736,809,000	39.9	293,659,000	42	48¼	41	49½	13,277,612	38,978
1902	28,653,000	34.5	987,843,000	30.7	303,585,000	29⅛	32	33⅜	38¼	8,381,805	150,065
1903	27,638,000	28.4	784,094,000	34.1	267,662,000	34¼	38	39⅝	44⅜	1,960,740	183,983
1904	27,843,000	32.1	894,596,000	31.3	279,900,000	28¼	32	[d] 28⅝	[d] 32	8,394,692	55,699
1905	28,047,000	34.0	953,216,000	29.1	277,048,000	[d] 29½	[d] 32⅜	[d] 32⅛	[d] 34⅝	48,434,541	40,025
1906	30,959,000	31.2	964,905,000	31.7	306,293,000	[d] 33	[d] 35¼	[d] 44⅛	[d] 48¾	6,386,334	91,289
1907	31,837,000	23.7	754,443,000	44.3	334,568,000	[d] 46⅛	[d] 50⅜	[d] 52¾	[d] 56¾	2,518,855	383,418
1908	32,344,000	25.0	807,156,000	47.2	381,171,000	[d] 48⅞	[d] 50½	[d] 56½	[d] 62½	2,333,817	6,691,703
1909	33,204,000	30.3	1,007,353,000	40.5	408,174,000	[d] 40	[d] 45				

[a] Oatmeal not included 1866 to 1882, inclusive.
[b] Oatmeal not included 1867 to 1882, inclusive.
[c] Census figures.
[d] Quotations are for standard.

OATS—Continued.

Acreage, production, value, and distribution of oats in the United States in 1909, by States.

[Quantity expressed in bushels, 000 omitted.]

State, Territory, or Division.	Crop of 1909.			Farm reserves of preceding year's growth Aug. 1			Farm reserves Mar. 1			Shipped out of county where grown		
	Acreage.	Production.	Farm value Dec. 1.	1909.		10-year average.	1910.		10-year average.	1910.		10-year average.
	Acres.	Bush.	Dollars.	Bush.	P.c.	P.c.	Bush.	P.c.	P.c.	Bush.	P.c.	P.c.
Maine	124,000	4,588	2,661,000	202	5.0	5.6	1,606	35	34	229	5	2
New Hampshire	14,000	441	282,000	12	3.0	3.3	106	24	30	4	1	1
Vermont	81,000	2,608	1,304,000	93	3.5	3.8	861	33	38	26	1	1
Massachusetts	7,000	217	126,000	2	1.0	2.8	78	36	29	0	0	0
Rhode Island	2,000	50	26,000	0	.8	1.5	16	31	31	0	0	0
Connecticut	11,000	302	160,000	4	1.0	.8	88	29	25	0	0	0
New York	1,325,000	37,365	18,309,000	1,120	3.0	6.2	14,946	40	43	2,616	7	7
New Jersey	60,000	1,530	765,000	111	6.0	5.8	536	35	40	214	14	11
Pennsylvania	998,000	25,948	12,974,000	958	3.5	6.6	9,082	35	41	1,557	6	6
N. Atlantic	*2,622,000*	*73,049*	*36,607,000*	*2,511*	*3.4*	*6.2*	*27,319*	*37.4*	*41.4*	*4,646*	*6.4*	*6.1*
Delaware	4,000	102	49,000	2	1.5	2.5	26	25	29	11	11	10
Maryland	28,900	711	348,000	10	1.3	2.7	185	26	26	92	13	13
Virginia	200,000	3,800	2,052,000	57	1.5	2.6	1,064	28	31	304	8	6
West Virginia	98,000	2,156	1,164,000	27	1.5	4.3	582	27	33	86	4	4
North Carolina	196,000	3,234	2,134,000	40	1.2	2.4	647	20	22	97	3	3
South Carolina	211,000	4,431	3,190,000	80	2.0	1.9	842	19	12	222	5	3
Georgia	350,000	6,650	4,722,000	57	1.1	2.5	998	15	15	332	5	2
Florida	31,000	527	395,000	3	.8	3.0	95	18	15	26	5	3
S. Atlantic	1,118,000	21,611	14,054,000	276	1.4	2.6	4,439	20.5	21.4	1,170	5.4	4.0
Ohio	1,730,000	56,225	23,052,000	1,156	3.0	7.1	20,803	37	36	17,992	32	29
Indiana	1,820,000	55,510	21,649,000	956	2.7	5.2	18,318	33	30	27,755	50	41
Illinois	4,346,000	159,064	60,444,000	2,735	2.9	5.6	54,082	34	35	84,304	53	48
Michigan	1,420,000	43,310	17,757,000	1,506	3.6	6.0	16,458	38	38	12,993	30	25
Wisconsin	2,280,000	79,800	31,122,000	3,874	5.3	8.6	35,112	44	42	18,354	23	19
N. C. E. Miss. R.	11,596,000	393,909	154,024,000	10,227	3.6	6.5	144,773	36.8	36.7	161,398	41.0	33.6
Minnesota	2,736,000	90,288	31,601,000	2,596	4.4	8.4	36,115	40	41	30,698	34	28
Iowa	4,300,000	116,100	40,635,000	4,086	3.7	6.4	40,635	35	36	48,762	42	35
Missouri	690,000	18,630	8,011,000	203	1.5	4.7	6,520	35	34	3,353	18	13
North Dakota	1,550,000	49,600	16,368,000	1,408	4.3	5.9	22,816	46	47	8,928	18	14
South Dakota	1,450,000	43,500	14,790,000	1,256	4.0	7.0	17,400	40	44	12,180	28	23
Nebraska	2,473,000	61,825	21,639,000	1,794	3.2	6.4	24,730	40	39	20,402	33	38
Kansas	964,000	27,185	11,690,000	437	2.0	4.6	9,515	35	35	4,078	15	15
N. C. W. Miss. R.	14,163,000	407,128	144,734,000	11,780	3.6	6.5	157,731	38.7	39.3	128,401	31.5	28.9
Kentucky	173,000	3,858	1,968,000	50	1.8	3.5	1,119	29	32	270	7	5
Tennessee	200,000	4,000	2,120,000	62	1.7	3.0	1,000	25	27	800	20	11
Alabama	270,000	4,455	3,118,000	51	1.2	3.2	668	15	15	89	2	2
Mississippi	150,000	2,400	1,632,000	22	1.0	4.1	480	20	15	48	2	1
Louisiana	32,000	640	397,000	5	.8	1.2	115	18	13	6	1	0
Texas	615,000	11,500	7,130,000	217	1.0	3.2	1,265	11	17	2,300	20	20
Oklahoma	550,000	15,950	7,337,000	79	.7	3.1	4,147	26	29	4,147	26	19
Arkansas	164,000	3,739	2,206,000	63	1.7	2.2	935	25	25	112	3	3
S. Central	2,154,000	46,542	25,908,000	549	1.1	3.1	9,729	20.9	22.1	7,772	16.7	15.9
Montana	300,000	15,390	6,464,000	264	2.5	7.4	5,848	38	38	6,618	43	30
Wyoming	100,000	3,500	1,750,000	71	2.5	3.8	1,155	33	28	735	21	7
Colorado	196,000	7,448	3,947,000	141	2.0	5.3	2,607	35	34	2,458	33	26
New Mexico	24,000	960	634,000	10	1.3	3.4	240	25	20	96	10	11
Arizona	4,000	148	117,000	0	.3	1.2	16	11	24	12	8	8
Utah	55,000	2,536	1,319,000	79	3.0	5.4	862	34	29	761	30	21
Nevada	7,000	280	165,000	8	2.5	4.2	92	33	22	98	35	9
Idaho	175,000	7,788	3,894,000	61	1.1	4.0	2,336	30	29	3,894	50	38
Washington	202,000	9,898	4,751,000	138	1.6	3.7	2,474	25	28	4,256	43	35
Oregon	288,000	10,886	5,661,000	181	1.9	5.2	2,722	25	31	4,681	43	32
California	200,000	6,280	4,145,000	27	.4	2.9	816	13	14	2,700	43	29
Far Western	1,551,000	65,114	32,847,000	980	1.8	4.9	19,168	29.4	29.7	26,309	40.4	29.7
United States	33,204,000	1,007,353	408,174,000	26,323	3.3	6.2	363,159	36.1	36.4	329,696	32.7	28.7

OATS—Continued.

Average yield per acre of oats in the United States.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	26.1	26.8	32.0	36.8	37.5	35.0	39.0	39.5	36.6	39.5	35.8	37.1	34.0	37.0
New Hampshire	32.5	34.9	32.1	33.5	32.6	29.5	35.0	31.1	33.2	32.8	34.5	32.5	30.6	31.5
Vermont	34.9	34.7	33.8	37.2	34.9	33.0	40.0	38.2	37.9	39.4	37.2	34.0	33.3	32.2
Massachusetts	30.5	31.0	30.9	33.1	30.8	31.0	32.2	31.7	34.0	32.0	34.0	35.0	33.0	31.0
Rhode Island	31.4	28.5	28.4	29.4	30.9	29.4	36.2	28.1	25.4	29.4	29.3	29.5	31.0	25.0
Connecticut	31.2	28.0	26.6	30.8	31.0	28.7	34.5	31.2	33.5	34.5	34.2	31.5	32.6	27.5
New York	32.2	30.5	26.2	31.4	27.9	21.6	40.0	34.0	34.1	34.2	32.3	30.7	30.1	28.2
New Jersey	28.3	29.0	26.0	27.0	29.6	16.0	32.2	25.4	32.5	32.0	26.6	29.5	30.7	25.5
Pennsylvania	30.6	30.2	25.7	29.8	31.1	18.9	36.5	28.6	33.9	34.0	27.4	29.6	27.3	26.0
North Atlantic	31.2	30.4	26.5	31.0	29.9	21.2	38.2	31.8	34.2	34.4	30.4	30.7	29.3	27.9
Delaware	16.6	22.6	19.9	23.7	21.0	18.5	22.6	22.2	28.2	31.2	24.5	30.0	29.8	25.5
Maryland	19.9	20.7	19.9	23.8	24.0	18.8	26.7	20.6	29.7	27.7	25.4	27.5	25.5	25.4
Virginia	16.4	12.1	13.5	16.0	14.8	14.9	17.5	13.8	21.1	17.8	18.0	19.6	19.1	19.0
West Virginia	21.2	20.0	19.3	22.7	21.0	18.7	28.6	21.7	26.4	24.1	20.6	19.3	19.0	22.0
North Carolina	13.8	11.4	11.1	13.5	13.9	14.4	12.7	11.4	15.8	15.3	16.2	15.6	16.5	16.5
South Carolina	10.4	12.0	11.1	14.8	15.5	15.8	13.1	14.0	17.1	16.3	18.5	20.0	20.0	21.0
Georgia	12.0	11.2	11.6	13.6	15.0	14.8	11.1	13.6	14.8	15.1	15.5	16.7	17.2	19.0
Florida	13.9	11.5	11.2	12.2	11.3	13.1	13.6	13.2	12.9	12.0	14.0	13.7	14.5	17.0
South Atlantic	16.5	12.6	12.9	16.4	15.6	15.3	15.2	14.2	18.2	17.1	17.6	18.1	18.3	19.3
Ohio	29.6	30.6	29.3	34.8	38.0	31.5	41.1	30.6	40.9	35.8	32.8	22.8	26.4	32.5
Indiana	25.2	26.7	26.4	31.0	32.7	28.6	35.4	24.4	33.1	35.3	28.2	20.2	21.2	30.5
Illinois	30.5	33.2	30.4	32.5	.8.0	28.2	37.7	26.6	32.0	35.5	29.5	24.5	23.0	36.6
Michigan	32.2	33.0	28.9	32.7	36.7	29.0	39.9	30.5	32.5	35.6	30.7	20.8	29.7	30.5
Wisconsin	33.9	33.1	30.3	34.9	32.0	29.1	39.9	32.8	35.0	39.0	37.4	22.0	31.1	35.0
North Central East of Mississippi River	30.6	31.9	29.6	33.2	35.7	28.9	38.5	28.8	34.1	36.4	31.7	22.6	25.8	34.0
Minnesota	35.1	34.3	31.0	33.3	25.2	32.1	39.0	32.3	39.2	37.5	32.5	24.5	22.0	33.0
Iowa	35.8	33.0	31.4	31.0	34.0	29.8	30.7	24.0	32.0	35.0	33.8	24.2	24.3	27.0
Missouri	29.4	26.6	24.0	22.5	27.4	11.2	32.5	22.1	22.7	27.2	22.8	21.5	19.3	27.0
North Dakota	.....	.....	28.0	29.1	10.3	32.6	38.4	27.4	37.4	38.9	32.5	24.5	23.4	32.0
South Dakota	.....	.....	22.6	30.4	21.5	28.8	34.8	38.6	39.0	39.0	36.4	24.7	23.0	30.0
Nebraska	34.9	30.5	24.2	28.0	21.8	19.8	34.6	29.5	30.7	31.0	29.5	20.4	22.0	25.0
Kansas	32.8	30.0	24.5	23.9	31.6	18.6	33.5	28.2	17.8	27.1	23.6	15.0	22.0	28.2
North Central West of Mississippi River	33.4	31.1	27.7	29.6	27.8	26.2	34.0	27.9	32.2	34.4	31.5	22.8	22.8	28.7
Kentucky	21.4	19.7	18.9	21.1	21.3	19.7	22.2	20.1	24.0	25.5	21.5	17.6	16.2	22.3
Tennessee	17.5	16.0	14.8	17.0	16.6	17.5	17.3	18.5	21.1	20.2	21.5	20.8	21.0	20.0
Alabama	13.0	12.3	12.0	14.1	14.4	14.5	10.9	15.8	14.9	16.5	17.2	17.5	18.0	16.5
Mississippi	15.1	13.0	12.3	15.3	14.0	15.2	15.4	15.0	19.2	18.5	18.0	17.9	17.5	16.0
Louisiana	16.5	13.7	13.5	16.1	18.0	13.4	15.2	15.9	18.4	16.0	17.2	14.5	20.0	20.0
Texas	26.5	27.7	23.1	27.6	38.0	16.3	23.2	35.5	32.0	31.4	34.8	19.0	28.9	18.7
Oklahoma	.....	.....	.....	30.5	38.0	22.7	41.7	27.9	26.0	34.2	34.3	15.0	25.0	29.0
Arkansas	21.7	18.9	17.9	19.1	22.2	12.3	20.0	18.6	22.7	20.3	20.5	19.5	21.4	22.8
South Central	19.7	17.6	17.4	23.2	24.5	17.1	24.3	26.7	26.1	27.7	29.3	17.8	23.7	21.6
Montana	.....	35.9	32.7	41.0	39.0	42.0	41.9	46.4	37.7	41.3	43.2	49.0	41.6	51.3
Wyoming	.....	29.7	30.4	33.9	34.2	41.0	36.0	29.4	30.2	39.9	39.5	37.0	36.4	35.0
Colorado	.....	30.7	28.5	32.2	32.8	33.8	26.8	33.3	35.4	35.0	40.4	38.0	39.5	38.0
New Mexico	.....	18.5	27.5	27.8	30.1	31.6	19.1	22.6	19.6	29.5	34.6	38.5	33.5	40.0
Arizona	.....	25.0	.....	32.7	30.0	35.0	31.7	35.5	30.1	31.2	34.4	29.0	36.0	37.0
Utah	.....	25.1	28.6	36.5	35.9	33.0	35.5	36.4	37.6	39.8	43.7	45.0	49.5	46.1
Nevada	34.4	31.0	27.4	36.1	35.0	43.0	34.8	28.6	37.0	37.2	38.8	43.0	45.0	40.0
Idaho	.....	33.5	31.4	39.3	36.6	38.3	42.1	41.5	39.3	39.4	40.7	50.5	44.0	44.5
Washington	.....	38.3	35.8	43.4	34.4	47.5	46.2	47.9	44.9	50.0	43.2	55.5	44.5	49.0
Oregon	35.0	31.7	27.6	27.0	18.5	31.5	28.7	33.8	23.1	24.1	33.8	35.0	33.4	37.8
California	33.8	27.9	28.0	29.5	24.6	30.4	30.5	34.8	34.1	28.0	31.5	33.5	33.5	31.4
Far Western	34.4	31.4	29.5	33.7	28.9	36.3	34.6	38.1	33.9	35.1	38.5	43.0	39.0	42.0
United States	28.1	27.6	25.6	29.6	29.6	25.8	34.5	28.4	32.1	34.0	31.2	23.7	25.0	30.3

OATS—Continued.

Average farm value per acre of oats in the United States December 1.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	14.09	12.06	13.76	14.72	14.25	17.50	17.55	17.77	16.47	16.55	15.75	22.26	20.40	21.46
N. Hampshire	17.55	16.05	14.12	14.07	12.39	15.34	15.40	14.93	15.60	14.10	15.18	19.85	18.08	20.14
Vermont	17.10	14.57	13.86	14.51	12.56	16.50	17.20	16.81	16.68	15.76	16.00	21.42	20.65	16.10
Massachusetts	18.00	15.50	13.60	13.90	13.98	17.05	14.49	15.53	15.30	13.76	14.96	21.00	20.43	18.00
Rhode Island	17.27	14.25	12.78	12.05	11.74	15.88	15.57	12.05	11.94	12.35	13.49	19.50	20.00	13.00
Connecticut	18.10	13.44	11.17	12.32	10.85	15.50	14.14	14.04	14.74	14.49	14.36	18.90	18.91	14.55
New York	14.81	11.90	9.43	10.99	8.93	10.37	14.40	13.94	12.96	12.65	12.92	17.50	16.80	13.82
New Jersey	13.30	11.31	9.88	9.72	9.18	7.52	12.56	10.92	13.00	11.84	10.11	16.52	16.88	12.75
Pennsylvania	12.85	11.17	9.25	9.83	9.33	8.50	12.41	10.58	12.88	12.24	10.41	15.98	15.01	13.00
N. Atlantic	14.07	11.80	9.73	10.73	9.51	9.99	13.70	12.68	13.21	12.73	12.00	17.25	16.44	13.96
Delaware	6.97	8.36	7.16	8.06	6.30	8.33	9.49	8.88	11.56	12.48	9.31	15.00	16.00	12.25
Maryland	8.36	7.66	6.96	7.85	7.44	7.71	10.15	8.24	10.69	9.97	9.65	13.47	13.50	12.43
Virginia	6.56	4.96	5.00	5.76	5.48	6.26	7.35	5.93	9.07	6.94	7.74	9.80	10.50	10.26
W. Virginia	7.21	7.20	7.14	8.40	7.14	8.04	11.73	9.98	11.62	9.40	8.24	10.42	10.64	11.88
N. Carolina	7.45	5.59	5.00	6.08	6.26	7.34	6.48	5.93	8.22	7.19	7.94	9.36	10.40	10.89
S. Carolina	7.59	7.80	6.10	7.84	7.44	9.80	7.73	8.26	10.26	8.96	10.54	14.40	15.00	15.12
Georgia	8.64	6.94	6.26	7.07	7.35	9.92	5.88	7.48	8.14	8.00	8.68	12.02	12.38	13.49
Florida	12.51	9.32	6.72	6.47	5.65	9.43	8.30	7.92	7.74	6.24	9.52	10.27	10.43	12.74
S. Atlantic	7.69	6.39	5.73	6.79	6.69	8.36	7.37	7.26	9.15	7.97	8.76	11.49	11.97	12.57
Ohio	10.06	9.79	8.79	9.74	9.88	12.28	13.15	11.02	13.00	11.10	10.82	10.26	12.94	13.32
Indiana	7.81	7.74	7.66	8.06	7.52	10.87	9.91	7.81	9.93	9.53	9.02	8.48	9.96	11.90
Illinois	8.54	8.96	8.21	8.45	8.74	11.28	10.56	8.51	9.60	9.94	9.14	10.05	10.81	13.91
Michigan	11.91	11.22	9.25	9.81	9.54	11.89	13.17	10.98	10.72	10.68	10.13	9.98	14.55	12.50
Wisconsin	11.53	9.60	8.48	9.07	7.36	11.35	11.97	11.15	9.80	10.53	11.59	10.34	14.62	13.65
N. C. E. of Miss. R.	9.67	9.35	8.41	8.83	8.47	11.41	11.36	9.64	10.25	10.24	10.04	9.88	12.28	13.28
Minnesota	11.93	9.60	8.06	7.99	6.05	10.91	10.53	9.60	10.19	9.00	8.77	10.05	9.46	11.55
Iowa	8.95	7.59	7.54	7.13	6.80	10.73	7.67	6.96	8.00	8.40	9.13	9.20	10.21	9.45
Missouri	8.82	7.18	6.24	6.08	6.30	4.82	9.10	7.07	7.72	8.16	7.52	8.81	8.69	11.61
N. Dakota	......	......	7.00	7.86	3.30	10.76	10.37	8.49	8.98	8.95	8.78	9.80	9.83	10.56
S. Dakota	......	......	5.65	7.30	5.16	9.79	10.09	11.19	9.75	8.97	9.10	9.63	9.43	10.20
Nebraska	10.12	6.71	5.57	6.44	5.23	7.33	8.65	7.97	7.67	7.44	7.67	7.55	9.02	8.75
Kansas	10.17	7.65	6.37	6.21	7.27	8.00	10.05	7.86	5.87	7.59	7.32	6.30	9.90	12.13
N. C. W. of Miss. R.	9.65	7.74	6.87	7.07	6.16	9.42	9.01	8.15	8.36	8.37	8.53	8.91	9.62	10.22
Kentucky	8.35	7.09	6.43	6.96	6.60	8.08	7.99	8.24	9.60	8.58	8.17	8.62	8.75	11.38
Tennessee	7.35	6.24	5.18	5.95	5.81	7.87	7.27	7.77	7.80	7.88	8.82	10.40	11.13	10.60
Alabama	9.36	7.63	6.36	6.91	6.34	9.28	6.00	8.53	8.05	8.42	8.77	11.72	11.88	11.55
Mississippi	12.38	8.32	6.40	7.50	6.44	9.58	7.85	7.65	9.98	9.25	8.82	11.63	11.73	10.88
Louisiana	16.17	8.63	6.48	7.08	7.20	8.04	7.60	7.31	8.28	7.20	7.74	7.96	12.80	12.41
Texas	18.82	13.57	9.24	10.76	11.40	9.78	11.37	15.62	14.08	12.56	14.27	11.40	15.03	11.59
Oklahoma	......	......	......	11.28	8.74	10.86	14.57	9.60	9.63	10.51	10.14	7.20	11.25	13.34
Arkansas	13.02	9.26	7.34	7.45	7.77	7.01	8.20	8.18	9.76	8.53	8.61	10.53	11.34	13.45
S. Central	9.02	8.34	6.84	8.93	8.12	9.19	10.28	11.27	11.10	10.53	11.20	9.95	12.49	12.03
Montana	......	18.67	14.39	15.58	16.38	15.12	15.08	16.24	17.34	17.76	19.01	22.54	20.38	21.55
Wyoming	......	14.26	13.07	14.92	16.07	19.68	18.00	14.70	11.78	16.36	15.80	19.62	18.21	17.50
Colorado	......	18.42	11.40	13.52	14.10	16.90	13.67	13.65	16.28	14.35	18.18	19.00	21.33	20.14
New Mexico	......	10.73	13.20	14.46	14.45	18.96	12.99	14.01	11.17	17.11	17.99	21.17	21.46	26.42
Arizona	......	15.50	......	21.91	20.70	21.00	23.78	21.65	22.27	19.97	22.36	17.50	26.75	29.25
Utah	......	11.80	11.44	15.70	15.80	16.83	16.68	17.84	17.67	17.51	19.66	21.60	23.77	23.98
Nevada	31.99	20.46	14.80	23.46	17.50	30.10	24.36	19.45	23.31	19.34	24.83	31.00	29.29	23.57
Idaho	......	18.09	13.50	15.72	14.64	16.85	20.21	18.68	19.65	16.55	17.50	21.21	20.68	22.25
Washington	......	16.47	13.60	17.36	13.76	16.63	22.64	18.20	19.31	20.50	17.71	24.97	21.36	23.52
Oregon	18.55	13.95	10.49	10.80	7.59	10.71	11.77	14.87	10.86	10.36	14.53	15.75	15.70	19.66
California	23.66	17.02	13.44	14.46	11.32	13.38	15.55	18.79	19.44	14.28	16.38	23.79	22.44	20.72
Far Western	21.12	15.42	11.95	14.15	12.20	14.60	15.77	16.43	16.16	15.23	17.06	20.81	20.08	21.18
United States	10.62	9.03	7.63	8.32	7.63	10.29	10.60	9.68	10.05	9.88	9.89	10.51	11.78	12.29

OATS—Continued.

Average farm price of oats per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900	1901	1902	1903	1904	1905	1906	1907	1908	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
Maine	54	45	43	40	38	50	45	45	45	43	44	60	60	60	66	70	68	56	58
New Hampshire	54	46	44	42	38	52	44	48	47	43	44	61	59	70	65	71	69	65	64
Vermont	49	42	41	39	36	50	43	44	44	40	43	63	62	60	64	68	67	54	50
Massachusetts	59	50	44	42	38	55	45	49	45	43	44	60	62	62	64	66	65	57	58
Rhode Island	55	50	45	41	38	54	43	45	47	42	45	66	64	63	65	66	67	55	53
Connecticut	58	48	42	40	35	54	41	45	44	42	42	60	58	60	62	70	70	55	53
New York	46	39	36	35	32	48	36	41	38	37	40	57	56	56	60	66	65	51	49
New Jersey	47	39	38	36	31	47	39	43	40	37	38	56	55	54	59	66	61	50	50
Pennsylvania	42	37	36	33	30	45	34	37	38	36	38	54	55	54	59	63	60	50	50
North Atlantic	45.1	38.8	36.7	34.6	31.8	47.1	35.9	39.9	38.6	37.0	39.5	56.2	56.1	55.7	60.1	65.2	63.3	51.4	50.1
Delaware	42	37	36	34	30	45	42	40	41	40	38	50	54	52	59	64	60	45	48
Maryland	42	37	35	33	31	41	38	40	36	36	38	49	53	52	59	65	57	53	46
Virginia	40	41	37	36	37	42	42	43	43	39	43	50	55	54	66	65	60	58	54
West Virginia	34	36	37	37	34	43	41	46	44	39	40	54	56	57	65	68	62	54	54
North Carolina	54	49	45	45	45	51	51	52	52	47	49	60	63	64	72	71	67	65	66
South Carolina	73	65	55	53	48	62	59	59	60	55	57	72	75	74	76	78	73	74	72
Georgia	72	62	54	52	49	67	53	55	55	53	56	72	72	73	75	75	75	72	71
Florida	90	81	60	53	50	72	61	60	60	52	68	75	72	80	77	77	80	72	75
South Atlantic	46.6	50.7	44.4	44.1	42.7	54.5	48.5	51.1	50.2	46.7	49.8	63.5	65.4	65.7	71.3	71.6	67.8	68.4	65.0
Ohio	34	32	30	28	26	39	32	36	32	31	33	45	49	49	55	57	50	40	41
Indiana	31	29	29	26	23	38	28	32	30	27	32	42	47	48	53	56	43	39	39
Illinois	28	27	27	26	23	40	28	32	30	28	31	41	47	48	52	[illegible]	42	37	38
Michigan	37	34	32	30	26	41	33	36	33	30	33	48	49	50	55	61	54	42	41
Wisconsin	34	29	28	26	23	39	30	34	28	27	31	47	47	48	51	55	52	37	39
N. C. E. of Miss. River	31.6	29.3	28.4	26.6	23.7	39.5	29.5	33.5	30.1	28.1	31.7	43.7	47.6	48.4	52.7	56.3	47.6	38.9	39.1
Minnesota	34	28	26	24	24	34	27	30	26	24	27	41	43	43	48	52	46	34	35
Iowa	25	23	24	23	20	36	25	29	25	24	27	38	42	43	48	51	44	34	35
Missouri	30	27	26	27	23	43	28	32	34	30	33	41	45	46	55	55	45	42	43
North Dakota	....	....	29	27	32	33	27	31	24	23	27	40	42	43	47	53	50	31	33
South Dakota	....	....	25	24	24	34	29	29	25	23	25	39	41	43	45	51	45	32	34
Nebraska	29	22	23	23	24	37	25	27	25	24	26	37	41	42	45	50	41	35	35
Kansas	31	25	26	26	23	43	30	30	33	28	31	42	45	47	55	59	46	43	43
N. C. W. of Miss. River	28.9	24.9	24.8	23.9	22.2	36.0	26.5	29.2	25.9	24.4	27.1	39.1	42.2	43.2	47.9	51.9	44.7	34.3	35.5
Kentucky	39	36	34	33	31	41	36	41	40	35	38	49	54	56	63	65	57	53	51
Tennessee	42	39	35	35	35	45	42	42	37	39	41	50	53	55	64	64	54	53	53
Alabama	72	62	53	49	44	64	55	54	54	51	51	67	66	68	71	74	70	70	70
Mississippi	82	64	52	49	46	63	51	51	52	50	49	65	67	64	71	72	70	66	68
Louisiana	98	63	48	44	40	60	50	46	45	45	45	55	64	70	68	71	66	62	62
Texas	71	49	40	39	30	60	49	44	44	40	41	60	52	56	63	67	50	59	62
Oklahoma	....	....	....	37	23	48	35	34	37	31	30	48	45	49	56	59	46	48	46
Arkansas	60	49	41	39	35	57	41	44	43	42	42	54	53	57	64	67	60	57	59
South Central	45.8	47.4	39.3	38.5	33.1	53.8	42.3	42.3	42.5	38.0	38.3	55.9	52.7	56.0	62.7	65.7	53.3	56.9	55.7
Montana	....	52	44	38	42	36	36	35	46	43	44	46	49	46	60	75	72	47	42
Wyoming	....	48	43	44	47	48	50	50	39	41	40	53	50	53	58	60	66	59	50
Colorado	....	60	40	42	43	50	51	41	46	41	45	50	54	55	68	80	70	55	53
New Mexico	....	58	48	52	48	60	68	62	57	58	52	55	64	57	75	70	70	58	66
Arizona	....	62	....	67	69	60	75	61	74	64	65	60	74	80	82	90	80	85	79
Utah	....	47	40	43	44	51	47	49	47	44	45	48	48	48	62	80	66	50	52
Nevada	93	66	54	65	50	70	70	68	63	52	64	72	65	51	82	75	....	90	59
Idaho	....	54	43	40	40	44	48	45	50	42	43	42	47	50	62	72	70	45	50
Washington	....	43	38	40	40	35	49	38	43	41	41	45	48	54	67	71	64	49	48
Oregon	53	44	38	40	41	34	41	44	47	43	43	45	47	48	60	65	60	53	52
California	70	61	48	49	46	44	51	54	57	51	52	71	67	56	66	73	63	61	66
Far Western	61.4	49.1	40.5	42.0	42.2	40.3	45.6	43.1	47.6	43.3	44.3	48.4	51.5	51.1	63.5	72.1	66.5	53.6	50.4
United States	37.8	32.7	29.8	28.1	25.8	39.9	30.7	34.1	31.3	29.1	31.7	44.3	47.2	48.1	53.2	57.4	50.0	41.0	40.5

OATS—Continued.

Wholesale prices of oats per bushel, 1896-1909.

Date.	New York.		Baltimore.		Cincinnati.		Chicago.		Milwaukee.		Duluth.		Detroit.		San Francisco.	
	No. 2, mixed.		No. 2, mixed.		No. 2, mixed.		No. 2.		No. 2, white.		No. 2.a		No. 2, white.		No. 1, white (per cwt.).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.		
1896	18¾	26	20	27	15½	23	14¾	20½	16½	22¼	15¼	20¾	18½	24½	$0.72½	$1.51
1897	21	29¼	21	28	16¾	25	15⅝	23⅞	16½	26	16¼	25½	19¼	26	1.12½	1.30
1898	25½	36	24	36	21½	34½	20¼	32	22¾	34½	20	33¼	23¼	36¼	1.15	1.42½
1899	25¾	35½	24½	35	21½	31½	19¼	28¼	22¾	31½	19½	30½	23½	33	1.22½	1.45
1900	24¾	29¾	24	29½	21	28	21	26¼	24	29	22½	28	24	29¼	1.22½	1.40
1901	28¼	52	28	53	25	50¾	23¼	48¼	25½	48¾	25¼	46⅞	28	60½	1.02½	1.55
1902	32	65	29	60	27	57	25	56	30½	58	27½	47⅜	34¾	61	1.15	1.50
1903	38	44½	34½	44	31½	43½	31¼	45	33½	41	31	40	35½	45	1.17½	1.37½
1904	34½	55½	33	48	31	44½	28¼	46	28½	45	27¾	43	31¾	48¼	1.25	1.60
1905	29	37½	27½	37	25	35½	25	34½	27¼	35½	25¼	32¾	26¼	37	1.37½	1.80
							Contract		No. 3, white							
1906.																
Jan.	36	37½	34½	37	32½	34	29½	32	30	32	29	30	33	35	.....	.....
Feb.	34	36	34	35½	32	33½	29⅝	30¾	29	31½	28¼	29½	32½	33¾	.....	.....
Mar.	34½	36½	34¼	35¾	32	33½	28⅛	30¾	29	32¼	28⅛	29¾	32	34	.....	.....
Apr.	36¼	37	35½	38	33	35	30⅞	32¾	30½	33¾	29⅞	31½	33¼	35	.....	.....
May	37	39	37½	39	33	37	32⅛	34¾	32	35½	31⅛	34½	35¼	37¾	.....	.....
June	39	45	38½	45½	37	43	33¾	42¾	33¾	43	33¾	41	37¼	43½	.....	.....
July	40	43½	38½	42½	34	41	30¼	39½	33	40	31¾	38	38	42	.....	.....
Aug.	34½	39	33½	39½	30	34	29⅜	32	29	35½	30	31	32	39	.....	.....
Sept.	34½	37½	34	37	31½	36	30	34¼	29	34	29¼	33	33	36½	.....	.....
Oct.	37½	38½	37	37¾	35	36½	32¼	34¾	32	34½	31¼	33	36	36½	.....	.....
Nov.	37½	39½	37	38½	35	36½	33	35¼	32	34¾	32	32⅝	36½	38½	.....	.....
Dec.	38	39	38	39½	36	38	33	35¾	32½	35½	31⅞	34	35	37	.....	.....
Year.	34	45	33½	45½	30	43	28⅝	42¾	29	43	28⅛	41	32	43¼	.....	.....
1907.											No. 3.		No. 3, white			
Jan.	38½	42	39½	42	37	40	33½	37½	32¾	38	33½	37	37	41½	1.42½	1.65
Feb.	41½	47½	41½	47	39½	45	37	41¼	37¼	42	37	39	42½	44¾	1.45	1.67½
Mar.	46½	48½	47	49	44	45½	39⅝	43	39¾	43	38	41	41	45½	1.45	1.70
Apr.	45½	47½	46½	49½	43	44½	41½	45½	40	43	39	42	42½	47½	1.50	1.75
May	46½	50	45½	48	43½	47	44½	48¾	42	48	41	44	46	49½	1.55	1.75
June	48½	50½	46½	49½	46	50	41⅝	49⅜	41½	48	40½	44½	46½	50	1.40	1.70
July	48½	49½	47	50½	45½	47½	41⅛	46	41½	46½	40	42	47¼	50	1.30	1.60
Aug.	50½	63	50½	59½	45	53	44⅞	54	45	54½	41	48	49	56	1.42½	1.55
Sept.	51	53	52	54½	49	52	51	56½	47	56	48	51	52	56	1.45	1.60
Oct.	50½	55½	53	57	44½	55½	45	54¾	39	54½	46	53	50	58	1.50	1.80
Nov.	51	52½	50	53½	45	49	44½	49	45	50¼	45	48	52	53	1.60	1.85
Dec.	51½	54½	50	54½	48	53	46½	50⅞	46½	53	46	49	52	54¼	1.55	1.70
Year.	38½	63	39½	59½	37	55½	33½	56½	32¾	56	33½	53	37	58	1.30	1.85
1908.																
Jan.	53	53½	53	54½	51½	52½	48¼	51½	49	52¼	46½	49	53¼	54	1.55	1.70
Feb.	53	57½	52½	56½	50½	53	48¼	53⅜	47½	53	47	50	52	55½	1.55	1.70
Mar.	55	57	56	57½	52½	54	52⅛	54⅝	50½	54½	49½	51	54¼	56	1.45	1.65
Apr.	54	54½	55½	56½	51	53	51¾	53⅞	50	53¼	47	49½	55	57	1.50	1.65
May	53½	57	56	57	50½	54½	52¾	56½	51½	56	49	51	55	56	1.47½	1.62½
June	52½	56	55½	57½	52	54½	50	53	48	54½	48½	50½	55	56	1.40	1.57½
July	53½	61½	57	62	50	60	51	60½	47½	62½	49	57	55	64	1.40	1.55
Aug.	50½	59½	50½	62	48	51½	46	50	45	47	46⅜	56	47	62	1.45	1.60
Sept.	52	53	51	52	50	53	48	50½	46	51¼	46¼	49½	49	53	1.60	1.67½
Oct.	51	53	50½	51½	47	51½	46¾	49	45½	52	45¾	47¾	50½	52½	1.60	1.68¾
Nov.	51½	55	51	54	48	52½	47⅝	49½	47	53	46	48½	51½	53	1.65	1.75
Dec.	52½	56	53	55	50½	52½	48⅜	50½	48¼	52½	47½	50	51	54	1.70	1.75
Year.	51	61½	50½	62	47	60	46	60½	45	62½	45¾	57	47	64	1.40	1.75
1909.																
Jan.	53½	54	54	54½	51	53½	49¼	50¼	49	51½	48¼	49⅛	52	53¼	1.70	1.90
Feb.	53½	57½	54	56	53	55	50	55¼	50½	55	48¾	51⅞	53½	57	1.85	1.92½
Mar.	56½	58	55½	58	53½	56½	52⅝	52⅝	51¼	55½	50½	53	55	57	1.87½	2.02½
Apr.	56½	58½	56	58	53½	56½	53	56¼	52½	56½	51⅛	53¾	57¼	57⅝	2.05	2.25
May	58½	62	58	62½	56	62	56¼	62½	56	62½	53¾	58½	57½	64½	2.15	2.25
June	59½	61½	58½	62½	55	60½	53¾	59	49	59½	50	57½	56½	62½	2.05	2.25
July	52½	59½	51	58½	45	55½	44½	53½	46	55½	40	50	50½	56½	1.95	2.15
Aug.	39½	52½	38½	52	35½	45	36½	43	35½	50	33	37½	36½	51	......	......
Sept.	39½	42	38½	42½	35½	42½	37¾	48	37	41½	34¼	38¼	39	41½	......	......
Oct.	41	42½	42	43	40	43	38⅛	41½	38½	42	35⅞	38½	41	43½	1.55	1.62½
Nov.	42	43	42½	43½	40½	42½	38⅜	39¾	38½	42½	36¼	39⅝	41	41½	1.57½	1.70
Dec.	42½	47	43	49	41	47½	40	45	40	45½	39½	43¾	42	46½	1.66	1.80
Year.	39½	62	38½	62½	35½	62	36½	62½	35½	62½	33	58½	36½	64½	1.55	2.25

a "No grade" in 1905.

OATS—Continued.

Average farm price of oats per bushel, monthly, 1908–9.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States east of Miss. R.		N. Cen. States west of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	48.1	46.1	56.8	55.3	65.5	63.2	48.1	46.3	42.8	42.6	55.2	54.1	53.4	46.0
February	48.1	......	55.7	......	65.7	......	48.4	......	43.2	......	56.0	......	51.1	......
March	51.1	47.9	57.9	56.6	68.8	66.2	51.3	47.6	45.6	43.6	61.6	62.0	58.0	48.3
April	53.2	50.0	60.1	59.9	71.3	68.3	52.7	50.2	47.9	45.8	62.7	60.1	63.5	47.6
May	55.3	50.4	62.9	62.4	71.4	65.9	54.5	50.7	49.7	45.5	64.4	61.8	68.9	49.5
June	57.4	51.8	65.2	63.0	71.6	68.5	56.3	52.5	51.9	46.7	65.7	61.5	72.1	51.7
July	56.2	50.2	65.1	61.5	71.6	68.3	54.9	50.9	50.3	45.5	63.7	56.6	73.1	51.3
August	50.0	49.8	63.3	61.0	67.8	67.2	47.6	50.2	44.7	45.5	53.3	54.7	66.5	51.2
September	42.3	47.2	55.4	57.8	68.4	65.9	40.3	47.2	34.6	42.8	56.9	53.7	57.1	51.2
October	41.0	47.2	51.4	55.2	68.4	67.2	38.9	48.0	34.3	42.7	56.9	53.8	53.6	48.7
November	41.0	46.5	50.1	55.0	64.3	65.8	39.4	47.0	34.7	42.0	57.5	53.2	50.0	51.2
December	40.5	47.2	50.1	56.1	65.0	65.4	39.1	47.6	35.5	42.2	55.7	52.7	50.4	51.5

BARLEY.

Barley area of countries named, 1905–1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
United States	5,095,500	6,323,800	6,448,000	6,646,000	7,011,000
Canada:					
New Brunswick	4,100	4,300	4,100	3,500	3,200
Ontario	772,600	756,200	766,900	743,800	721,500
Manitoba	432,300	474,200	649,600	662,500	696,000
Saskatchewan	32,900	53,600	79,300	81,000	135,000
Alberta	64,800	73,600	54,700	129,800	186,000
Other	(a)	(a)	128,700	125,100	123,200
Total Canada	....	....	1,683,300	1,745,700	1,864,900
Mexico	(a)	(a)	(a)	(a)	(a)
EUROPE.					
Austria-Hungary:					
Austria	2,935,900	2,909,100	2,882,500	2,757,200	2,820,500
Hungary proper	2,552,500	2,603,000	2,725,200	2,647,500	2,857,800
Croatia-Slavonia	169,900	164,600	160,900	159,800	156,700
Bosnia-Herzegovina	(a)	257,700	292,100	262,200	204,400
Total Austria-Hungary	....	5,934,400	6,060,700	5,826,700	6,039,400
Belgium	94,400	86,900	92,000	90,400	(a)
Bulgaria	576,200	572,300	573,800	621,100	(a)
Denmark	603,900	590,700	577,500	577,500	580,700
Finland	(a)	(a)	(a)	(a)	(a)
France	1,746,200	1,752,800	1,761,500	1,802,800	1,821,800
Germany	4,035,800	4,063,700	4,205,000	4,025,200	4,068,200
Italy	(a)	(a)	(a)	(a)	(a)
Netherlands	81,800	70,800	76,500	74,600	(a)
Norway	(a)	(a)	88,500	96,300	96,400
Roumania	1,306,600	1,380,600	1,259,500	1,532,500	1,357,100
Russia:					
Russia proper	20,236,000	19,823,300	20,403,200	21,913,700	(b)
Poland	1,160,700	1,185,800	1,212,200	1,243,100	(b)
Northern Caucasia	2,345,500	2,353,500	2,533,100	2,790,400	(b)
Total Russia (European)	23,742,200	23,362,600	24,148,500	25,947,200	....
Servia	266,300	270,200	250,200	254,800	(a)
Spain	3,336,200	3,620,100	3,561,100	3,466,700	3,480,000
Sweden	514,000	502,800	487,000	(a)	(a)

[a] No official statistics of area; estimates of production on pp. 467–468.

[b] No detailed official statistics either of area or production.

BARLEY—Continued.

Barley area of countries named, 1905–1909—Continued.

Country.	1905.	1906.	1907.	1908.	1909.
EUROPE—continued.					
United Kingdom:					
Great Britain—	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
England	1,410,300	1,439,700	1,411,200	1,383,300	1,379,100
Scotland	212,100	218,700	210,300	197,400	200,000
Wales	91,200	92,800	90,600	86,700	85,300
Ireland	154,700	176,600	170,400	154,600	163,100
Total United Kingdom	1,868,300	1,927,800	1,882,500	1,822,000	1,827,500
ASIA.					
Cyprus	(a)	(a)	(a)	(a)	(a)
Japanese Empire:					
Japan	3,342,900	3,359,200	3,316,900	3,266,300	(a)
Formosa	(a)	(a)	(a)	(a)	(a)
Russia:					
Central Asia	169,000	148,700	216,500	232,900	(b)
Siberia	294,100	307,300	315,800	355,600	(b)
Transcaucasia	1,300	1,100	700	1,100	(b)
Total Russia (Asiatic)	464,400	457,100	533,000	589,600	....
AFRICA.					
Algeria	3,196,200	3,264,100	3,168,600	3,208,300	3,284,000
Cape of Good Hope	(a)	(a)	(a)	(a)	(a)
Natal	1,400	600	600	600	(a)
Sudan (Anglo-Egyptian)	(a)	(a)	(a)	(a)	(a)
Tunis	(a)	1,030,400	1,188,500	1,088,800	(a)
AUSTRALASIA.					
Australia:					
Queensland	17,400	5,200	8,600	6,900	7,400
New South Wales	14,900	9,500	7,900	11,900	9,500
Victoria	46,100	40,900	52,800	63,100	65,200
South Australia	23,900	26,300	28,100	37,300	44,900
Western Australia	3,300	3,700	3,600	6,000	7,300
Tasmania	7,600	5,400	5,300	5,900	(a)
New Zealand	32,200	32,900	36,700	36,200	48,900
Total Australasia	145,400	123,900	143,000	167,300	....

Barley crop of countries named, 1905–1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	136,651,000	178,916,000	153,597,000	166,756,000	170,284,000
Canada:					
New Brunswick	97,000	99,000	97,000	79,000	94,000
Ontario	24,265,000	25,253,000	21,718,000	21,124,000	20,952,000
Manitoba	14,064,000	17,533,000	16,753,000	17,093,000	20,866,000
Saskatchewan	894,000	1,316,000	1,350,000	1,952,000	4,493,000
Alberta	1,774,000	2,158,000	1,083,000	3,881,000	5,999,000
Other	3,000,000	3,000,000	3,341,000	2,633,000	2,994,000
Total Canada	*44,094,000*	*49,359,000*	*44,342,000*	*46,762,000*	*55,398,000*
Mexico	6,621,000	7,000,000	7,000,000	7,000,000	7,000,000
Total	187,366,000	235,275,000	204,939,000	220,518,000	232,682,000
EUROPE.					
Austria-Hungary:					
Austria	70,469,000	76,024,000	78,555,000	69,497,000	79,654,000
Hungary proper	62,453,000	69,747,000	63,078,000	56,324,000	71,868,000
Croatia-Slavonia	2,864,000	2,758,000	2,064,000	2,552,000	2,394,000
Bosnia-Herzegovina	3,236,000	3,276,000	2,388,000	2,389,000	3,755,000
Total Austria-Hungary	139,022,000	151,805,000	146,085,000	130,762,000	157,671,000

a No official statistics of area; estimates of production on pp. 467–489.
b No detail official statistics either of area or production.

BARLEY—Continued.

Barley crop of countries named, 1905–1909—Continued.

Country	1905.	1906.	1907.	1908.	1909.
EUROPE—continued.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Belgium	4,518,000	4,349,000	5,129,000	4,423,000	5,000,000
Bulgaria	11,431,000	12,008,000	6,772,000	11,311,000	12,000,000
Denmark	19,596,000	19,975,000	21,616,000	20,166,000	21,000,000
Finland	5,318,000	5,424,000	5,000,000	6,000,000	5,000,000
France	40,841,000	36,538,000	43,043,000	40,673,000	47,782,000
Germany	134,204,000	142,901,000	160,650,000	140,539,000	160,552,000
Italy	8,000,000	8,000,000	8,000,000	9,000,000	10,000,000
Netherlands	4,013,000	3,260,000	4,091,000	3,953,000	4,000,000
Norway	3,464,000	3,262,000	2,597,000	3,540,000	2,885,000
Roumania	26,383,000	33,539,000	20,062,000	12,873,000	19,955,000
Russia:					
Russia proper	272,694,000	243,619,000	277,500,000	297,449,000	....
Poland	22,732,000	23,351,000	25,395,000	23,790,000	....
Northern Caucasia	43,410,000	37,306,000	41,206,000	46,219,000	....
Total Russia (European)	338,836,000	304,276,000	344,101,000	367,458,000	464,733,000
Servia	3,670,000	4,848,000	3,137,000	3,351,000	4,000,000
Spain	45,917,000	90,264,000	53,598,000	69,596,000	81,579,000
Sweden	12,858,000	14,328,000	12,811,000	15,520,000	13,900,000
United Kingdom:					
Great Britain—					
England	48,778,000	51,543,000	51,926,000	46,353,000	52,348,000
Scotland	8,257,000	7,803,000	7,466,000	7,410,000	7,732,000
Wales	2,906,000	3,116,000	2,881,000	2,682,000	2,810,000
Ireland	7,111,000	7,144,000	6,934,000	7,064,000	8,258,000
Total United Kingdom	67,052,000	69,606,000	69,207,000	63,509,000	71,148,000
Total	865,123,000	904,383,000	905,899,000	902,674,000	1,081,205,000
ASIA.					
Cyprus	2,980,000	2,778,000	2,963,000	2,420,000	2,500,000
Japanese Empire:					
Japan	77,473,000	83,967,000	90,480,000	87,138,000	88,142,000
Formosa	50,000	49,000	50,000	50,000	50,000
Total Japanese Empire	77,523,000	84,016,000	90,530,000	87,188,000	88,192,000
Russia:					
Central Asia	3,145,000	2,613,000	4,385,000	4,266,000	....
Siberia	4,965,000	5,136,000	4,957,000	6,103,000	....
Transcaucasia	20,000	13,000	4,000	13,000	....
Total Russia (Asiatic)	8,130,000	7,762,000	9,346,000	10,382,000	8,884,000
Total	88,633,000	94,556,000	102,839,000	99,990,000	99,576,000
AFRICA.					
Algeria	27,330,000	47,600,000	41,543,000	35,000,000	50,008,000
Cape of Good Hope	900,000	900,000	900,000	760,000	873,000
Natal	7,000	5,000	5,000	7,000	6,000
Sudan (Anglo-Egyptian)	327,000	334,000	300,000	300,000	300,000
Tunis	7,119,000	7,863,000	9,506,000	5,057,000	8,000,000
Total	35,683,000	56,702,000	52,254,000	41,124,000	59,187,000
AUSTRALASIA.					
Australia:					
Queensland	342,000	64,000	163,000	67,000	142,000
New South Wales	275,000	115,000	158,000	77,000	172,000
Victoria	902,000	1,095,000	1,295,000	1,093,000	1,706,000
South Australia	358,000	522,000	507,000	585,000	852,000
Western Australia	39,000	51,000	50,000	79,000	77,000
Tasmania	168,000	97,000	146,000	154,000	190,000
Total Australia	2,084,000	1,944,000	2,319,000	2,055,000	3,139,000
New Zealand	1,164,000	1,056,000	1,068,000	1,200,000	2,000,000
Total Australasia	3,248,000	3,000,000	3,387,000	3,255,000	5,139,000
Grand total	1,180,053,000	1,293,916,000	1,269,318,000	1,267,561,000	1,477,789,000

BARLEY—Continued.

Acreage, production, value, prices, exports, etc., of barley in the United States, 1849-1909.

Year.	Acreage sown and harvested.	Average yield per acre.	Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.	Chicago cash price per bushel, No. 2. December. Low.	Chicago cash price per bushel, No. 2. December. High.	Chicago cash price per bushel, No. 2. May of following year. Low.	Chicago cash price per bushel, No. 2. May of following year. High.	Domestic exports, fiscal year beginning July 1.	Imports, fiscal year beginning July 1.
	Acres.	*Bush.*	*Bushels.*	*Cents.*	*Dollars.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Bushels.*	*Bushels.*
1849 [a]	....	.....	5,167,000	...	....						....
1859 [a]	....	.....	15,826,000	...	....						
1866	493,000	22.9	11,284,000	70.2	7,916,000	59	70	85	100		3,247,250
1867	1,131,000	22.7	25,727,000	70.1	18,028,000	150	180	227	250	9,810	3,783,968
1868	937,000	24.4	22,896,000	109.0	24,948,000	140	170	149	175	59,077	5,069,880
1869	1,026,000	27.9	28,652,000	70.8	20,298,000	74	85	50	62	255,490	6,727,597
1870	1,109,000	23.7	26,295,000	79.1	20,792,000	68	80	72	95	340,093	4,866,700
1871	1,114,000	24.0	26,718,000	75.8	20,264,000	55½	64	55	71	86,891	5,565,591
1872	1,397,000	19.2	26,846,000	68.6	18,416,000	60	73	71	85	482,410	4,244,751
1873	1,387,000	23.1	32,044,000	86.7	27,794,000	132	158	130	155	320,399	4,891,189
1874	1,581,000	20.6	32,552,000	86.0	27,998,000	120	129½	115	137	91,118	6,255,063
1875	1,790,000	20.6	36,909,000	71.1	27,368,000	81	88	62½	72½	317,781	10,285,957
1876	1,767,000	21.9	38,710,000	63.0	24,403,000	63¾	68½	80	85	1,186,129	6,702,965
1877	1,615,000	21.3	34,441,000	62.8	21,629,000	56¼	64	46½	52½	3,921,501	6,764,228
1878	1,790,000	23.6	42,246,000	57.9	24,454,000	91	100	64	73	715,536	5,720,979
1879	1,681,000	24.0	40,283,000	58.9	23,714,000	86	92	75	80	1,128,923	7,135,258
1880	1,843,000	24.5	45,165,000	66.6	30,091,000	100	120	95	105	885,246	9,528,616
1881	1,968,000	20.9	41,161,000	82.3	33,863,000	101	107	100	100	205,930	12,182,722
1882	2,272,000	21.5	48,954,000	62.9	30,768,000	79	82	80	80	433,005	10,050,687
1883	2,379,000	21.1	50,136,000	58.7	29,420,000	62	67	65	74	724,955	8,596,122
1884	2,609,000	23.5	61,203,000	48.7	29,779,000	54	58	65	65	620,130	9,986,507
1885	2,729,000	21.4	58,360,000	56.3	32,868,000	62	65	58	60	252,183	10,197,115
1886	2,653,000	22.4	59,428,000	53.6	31,841,000	51	54	57	57	1,305,300	10,355,594
1887	2,902,000	19.6	56,812,000	51.9	29,464,000	80	80	69	77	550,884	10,831,461
1888	2,996,000	21.3	63,884,000	59.0	37,672,000	.....	.....	.....	.....	1,440,321	11,368,414
1889	3,221,000	24.3	78,333,000	41.6	32,614,000	58	58	.....	.....	1,408,311	11,332,545
1890	3,135,000	21.4	67,168,000	62.7	42,141,000	.....	.....	.....	.....	973,062	5,078,733
1891	3,353,000	25.9	86,839,000	52.4	45,470,000	.....	.....	.....	.....	2,800,075	3,146,328
1892	3,400,000	23.6	80,097,000	47.5	38,026,000	65	67	65	65	3,035,267	1,970,129
1893	3,220,000	21.7	69,869,000	41.1	28,729,000	52	54	55	60	5,219,405	791,061
1894	3,171,000	19.4	61,400,000	44.2	27,134,000	53½	55½	51	52	1,563,754	2,116,816
1895	3,300,000	26.4	87,073,000	33.7	29,312,000	(b) 33	40	(b) 25	36	7,680,331	837,384
1896	2,951,000	23.6	69,695,000	32.3	22,491,000	22	37	24½	35	20,030,301	1,271,787
1897	2,719,000	24.5	66,685,000	37.7	25,142,000	25½	42	36	53	11,237,077	124,804
1898	2,583,000	21.6	55,792,000	41.3	23,064,000	40	50½	36	42	2,267,403	110,475
1899	2,878,000	25.5	73,382,000	40.3	29,594,000	35	45	36	44	23,661,662	189,757
1900	2,894,000	20.4	58,926,000	40.9	24,075,000	37	61	37	57	6,293,207	171,004
1901	4,296,000	25.6	109,933,000	45.2	49,705,000	56	63	64	72	8,714,268	57,406
1902	4,661,000	29.0	134,954,000	45.9	61,899,000	36	70	48	56	8,429,141	56,462
1903	4,993,000	26.4	131,861,000	45.6	60,166,000	42	61½	58	59	10,881,627	90,708
1904	5,146,000	27.2	139,749,000	42.0	58,652,000	38	52	40	50	10,661,655	81,020
1905	5,096,000	26.8	136,651,000	40.3	55,047,000	37	53	42	55½	17,729,360	18,049
1906	6,324,000	28.3	178,916,000	41.5	74,236,000	44	56	66	85	8,238,842	38,319
1907	6,448,000	23.8	153,597,000	66.6	102,290,000	78	102	60	75	4,349,078	199,741
1908	6,646,000	25.1	166,756,000	55.4	92,442,000	57	64½	.....	.....	6,580,393	2,644
1909	7,011,000	24.3	170,284,000	55.2	93,971,000	.....	.....	.....	.....	....	....

[a] Census figures.

[b] Prices from 1895 on are for No. 3 grade.

BARLEY—Continued.

Average yield of barley in countries named, bushels per acre, 1889–1908.

Year.	United States.	Russia, European.[b]	Germany.[b]	Austria.[b]	Hungary proper.[b]	France.[a]	United Kingdom.[a]
Average (1889-1898)	23.3	13.2	28.4	20.3	....	21.9	34.7
1899	25.5	10.9	33.8	24.9	24.0	22.7	35.8
1900	20.4	11.5	33.4	20.2	20.9	21.8	32.7
1901	25.6	11.2	33.2	22.4	20.0	21.1	32.7
1902	29.0	15.6	35.0	24.6	24.7	24.5	37.0
1903	26.4	15.5	36.3	24.8	25.1	25.2	33.4
1904	27.2	14.4	33.7	22.8	19.8	22.0	32.3
1905	26.8	14.3	33.2	24.0	24.5	23.4	35.9
1906	28.3	14.1	35.2	26.1	26.8	26.8	36.2
1907	23.8	14.2	38.2	27.3	29.7	24.4	36.8
1908	25.1	....	31.9	25.3	21.2	23.0	33.8
Average (1899-1908)	26.0	[c] 13.7	34.5	26.0	23.2	23.5	34.7

[a] Winchester bushels. [b] Bushels of 48 pounds. [c] Average, 1898-1907.

Acreage, production, and value of barley in the United States in 1909.

State, Territory, or Division.	Acreage.	Production.	Farm value Dec. 1.
	Acres.	*Bushels.*	*Dollars.*
Maine	8,000	228,000	176,000
N. Hampshire	2,000	50,000	40,000
Vermont	15,000	450,000	346,000
New York	77,000	1,910,000	1,318,000
Pennsylvania	9,000	196,000	131,000
N. Atlantic	111,000	2,834,000	2,011,000
Maryland	1,000	32,000	20,000
Virginia	3,000	86,000	61,000
S. Atlantic	4,000	118,000	81,000
Ohio	32,000	829,000	506,000
Indiana	9,000	212,000	134,000
Illinois	31,000	868,000	451,000
Michigan	67,000	1,655,000	1,010,000
Wisconsin	866,000	24,248,000	13,579,000
N. C. E. of Miss. River	1,005,000	27,812,000	15,680,000
Minnesota	1,339,000	31,600,000	14,852,000
Iowa	495,000	10,890,000	5,009,000
Missouri	2,000	50,000	34,000
North Dakota	987,000	20,727,000	8,913,000
South Dakota	1,021,000	19,910,000	8,960,000
Nebraska	120,000	2,640,000	1,135,000
Kansas	270,000	4,860,000	2,576,000
N. C. W. of Miss. River	4,234,000	90,677,000	41,479,000
Kentucky	1,000	24,000	18,000
Tennessee	1,000	24,000	19,000
Texas	4,000	78,000	78,000
Oklahoma	30,000	690,000	448,000
S. Central	36,000	816,000	563,000
Montana	50,000	1,900,000	1,197,000
Wyoming	4,000	124,000	92,000
Colorado	26,000	936,000	618,000
New Mexico	1,000	40,000	40,000
Arizona	32,000	1,280,000	1,126,000
Utah	13,000	520,000	343,000
Nevada	8,000	304,000	228,000
Idaho	62,000	2,480,000	1,463,000
Washington	182,000	7,189,000	4,601,000
Oregon	63,000	1,984,000	1,309,000
California	1,180,000	31,270,000	23,140,000
Far Western	1,621,000	48,027,000	34,157,000
United States	7,011,000	170,284,000	93,971,000

BARLEY—Continued.

Condition of the barley crop in the United States on the first of months named, 1889-1909.

Year.	June.	July.	August.	When harvested.	Year.	June.	July.	August.	When harvested.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1889	95.6	91.9	90.6	88.9	1900	86.2	76.3	71.6	70.7
1890	86.4	88.3	82.8	78.6	1901	98.8	91.3	86.9	83.8
1891	90.3	90.9	93.8	94.3	1902	93.6	93.7	90.2	89.7
1892	92.1	92.0	91.1	87.4	1903	91.5	86.8	83.4	82.1
1893	88.3	88.8	84.6	83.8	1904	90.5	88.5	88.1	87.4
1894	82.2	76.8	69.8	71.5	1905	93.7	91.5	89.5	87.8
1895	90.3	91.9	87.2	87.6	1906	93.5	92.5	90.3	89.4
1896	98.0	88.1	82.9	83.1	1907	84.9	84.4	81.5	78.5
1897	87.4	88.5	87.5	86.4	1908	89.7	86.2	83.1	81.2
1898	78.8	85.7	79.3	79.2	1909	90.6	80.2	85.4	80.5
1899	91.4	92.0	93.6	86.7					

Average farm price of barley per bushel, monthly, 1908-1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	56.5	70.4	70.6	78.7	69.3	62.6	59.6	75.0	49.2	70.3	64.5	53.5	71.4	67.9
February	58.3	......	71.4	......	70.2	......	60.6	......	50.5	......	55.0	......	75.3	......
March	59.4	66.8	72.8	82.0	70.2	67.0	60.9	71.5	52.7	65.0	60.4	63.9	74.2	67.0
April	61.2	66.5	79.5	82.8	72.8	60.0	62.1	72.7	54.9	63.9	68.8	77.0	74.6	67.5
May	63.8	65.4	80.1	76.5	71.9	67.0	64.8	71.9	56.2	61.0	84.9	77.9	80.7	69.6
June	67.0	61.3	85.1	85.9	76.0	66.3	70.3	68.4	59.8	55.8	64.1	55.2	81.5	70.8
July	67.0	58.1	83.1	84.0	74.5	68.3	68.7	65.0	59.9	52.1	67.3	63.2	82.0	68.1
August	61.2	57.1	82.0	86.0	70.9	68.3	66.1	60.5	53.8	51.3	50.5	48.7	74.6	68.8
September	54.6	56.1	75.0	80.1	72.0	66.7	58.5	59.5	45.2	51.2	71.1	52.2	73.4	65.9
October	53.4	55.3	74.0	71.4	75.0	70.3	57.6	58.0	44.8	50.5	66.3	61.0	70.2	65.3
November	53.3	53.7	72.0	67.0	71.0	66.7	58.4	56.4	45.0	47.9	71.1	63.4	68.6	67.1
December	55.2	55.4	71.0	70.4	68.6	68.4	56.4	58.7	45.7	48.3	69.0	61.1	71.1	69.5

BARLEY—Continued.

Average yield per acre of barley in the United States.

State, Territory, or Division.	10-year averages. 1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	19.8	21.2	24.2	28.8	27.4	27.5	29.4	29.9	32.7	29.0	31.5	28.0	28.0	28.5
New Hampshire	24.8	21.8	23.4	22.7	22.7	21.5	21.2	19.8	20.7	20.8	21.4	24.0	24.0	25.0
Vermont	24.8	25.4	26.0	31.2	29.1	29.6	29.7	29.2	33.1	31.5	32.8	28.5	33.0	30.0
Massachusetts	22.7	23.2	23.0	29.0	25.8	...	...	...	...	...	...	...	...	...
Rhode Island	24.1	21.9	...	...	28.0	...	...	...	...	...	...	...	...	...
New York	22.0	23.0	21.0	24.1	22.0	14.0	28.5	26.6	26.8	25.7	26.3	25.0	26.0	24.8
Pennsylvania	21.5	22.3	19.6	20.8	19.0	17.2	21.0	21.3	22.6	25.0	25.0	25.5	26.0	21.8
North Atlantic	21.9	23.0	21.3	24.8	22.8	16.3	28.1	26.6	27.4	27.2	27.2	25.7	27.0	25.5
Maryland	20.9	...	22.6	24.7	20.0	18.0	27.0	25.9	21.8	31.0	31.0	33.0	30.0	32.0
Virginia	16.3	15.7	18.4	24.1	22.0	24.9	18.3	24.4	24.7	28.0	28.6	29.0	28.0	28.5
South Atlantic	17.0	14.7	19.4	24.2	21.0	22.5	21.5	25.0	23.7	29.1	29.5	30.3	28.5	29.5
Ohio	22.8	22.7	24.7	26.7	27.0	24.9	32.3	23.3	27.5	26.2	30.0	28.0	27.5	25.9
Indiana	21.9	22.7	20.9	24.6	24.6	25.4	28.0	22.8	29.2	28.0	29.4	20.5	23.0	23.5
Illinois	23.1	21.2	22.2	26.9	25.6	24.5	28.6	28.2	27.1	30.0	30.0	28.0	28.5	28.0
Michigan	22.1	21.0	21.5	24.5	23.9	22.8	28.6	25.2	24.1	27.0	26.1	22.0	25.5	24.7
Wisconsin	26.4	24.5	25.2	28.9	25.5	27.2	33.8	27.7	30.0	29.9	30.7	23.0	30.0	28.0
N. Central E. of Miss. R.	23.6	23.6	24.4	28.5	25.4	26.7	33.1	27.2	29.4	29.6	30.3	23.1	29.5	27.7
Minnesota	25.5	25.9	24.5	26.4	22.4	25.8	28.6	25.3	28.4	27.0	28.0	22.5	25.0	23.6
Iowa	25.2	22.6	22.6	25.6	26.4	23.6	26.3	23.4	27.8	26.0	28.3	25.5	27.0	22.0
Missouri	22.9	19.7	20.8	19.8	20.8	16.5	25.0	18.3	20.3	23.0	24.2	23.0	23.0	25.0
North Dakota	...	...	22.0	23.5	8.2	28.2	31.6	21.6	28.1	28.0	25.8	18.3	19.5	21.0
South Dakota	...	...	17.2	25.0	14.3	22.4	29.2	31.4	28.0	30.0	29.0	23.0	26.5	19.5
Nebraska	27.8	20.1	19.7	24.1	17.6	16.0	31.1	26.6	27.4	27.5	28.0	20.8	23.5	22.0
Kansas	24.5	19.2	18.6	19.6	21.5	15.9	16.0	31.9	21.6	22.0	23.5	12.0	16.0	18.0
N. Central W. of Miss. R.	25.3	22.6	22.4	25.2	20.3	24.1	28.2	25.3	27.8	27.2	27.4	21.1	23.7	21.4
Kentucky	19.6	22.3	24.0	21.2	28.6	19.4	25.9	21.4	20.6	24.0	26.0	25.0	25.0	24.0
Tennessee	19.5	14.9	15.8	17.3	14.7	15.8	16.0	20.6	22.0	21.6	23.0	20.0	25.0	24.0
Texas	25.1	20.3	15.4	21.4	24.6	13.5	21.3	24.4	31.0	24.0	24.5	17.0	24.0	19.4
Oklahoma	...	...	...	28.2	27.0	22.0	36.0	26.9	30.1	26.0	29.8	18.7	23.0	23.0
South Central	20.0	20.8	19.5	25.8	22.2	19.6	31.4	25.7	29.5	25.2	28.3	18.7	23.2	22.7
Montana	...	29.9	27.3	35.2	38.8	39.0	37.0	40.2	29.9	33.0	33.0	38.0	35.0	38.0
Wyoming	...	...	...	28.0	32.0	32.5	24.4	21.3	30.1	31.7	31.4	32.0	35.0	31.0
Colorado	...	22.6	26.9	29.5	24.8	28.7	26.3	28.3	37.1	33.0	41.0	40.0	33.0	36.0
New Mexico	...	19.6	22.1	26.2	29.0	31.7	16.1	23.1	23.6	21.0	27.0	26.0	42.0	40.0
Arizona	...	19.2	22.2	32.9	30.0	28.7	25.2	32.8	33.6	44.0	42.2	35.5	38.0	40.0
Utah	...	22.3	26.5	34.4	36.5	35.0	32.1	37.5	38.3	37.0	44.0	39.0	45.0	40.0
Nevada	27.5	22.5	26.8	34.4	33.0	33.0	34.3	34.6	35.9	34.0	36.8	40.0	30.0	38.0
Idaho	...	28.2	26.5	35.1	32.8	40.2	46.3	34.4	37.4	40.0	41.0	44.5	41.0	40.0
Washington	...	30.4	30.3	37.9	33.4	43.5	43.7	37.9	34.8	40.0	36.5	40.5	30.5	39.5
Oregon	29.1	27.0	25.7	29.6	28.9	30.6	31.9	33.2	28.7	31.0	35.0	42.0	29.0	31.5
California	23.4	20.6	21.2	22.0	16.7	26.0	26.0	25.7	22.7	21.5	27.2	28.9	23.5	26.5
Far western	23.7	21.2	22.1	24.8	18.3	28.6	28.7	28.0	25.1	25.2	29.1	31.9	26.1	29.6
United States	22.9	22.1	22.6	25.1	20.4	25.6	29.0	26.4	27.2	26.8	28.3	23.8	25.1	24.3

BARLEY—Continued.

Average farm value per acre of barley in the United States December 1.

State, Territory, or Division.	10-year averages. 1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	16.24	16.11	16.21	17.86	16.99	18.43	19.99	21.23	23.22	19.72	20.18	21.88	22.62	22.00
N. Hampshire	22.32	16.79	16.15	15.66	15.21	17.20	15.90	16.63	15.53	15.18	[illegible]	19.00	19.00	20.00
Vermont	23.06	19.81	16.38	16.85	15.13	19.54	18.12	17.52	21.85	21.18	20.31	21.36	23.07	23.07
Massachusetts	22.25	19.26	16.79	18.85	17.80	...								
Rhode Island	22.90	18.62	18.54	18.18	21.56	..								
New York	19.58	17.25	14.07	12.29	11.22	7.84	15.68	14.63	15.28	13.88	14.17	20.00	18.49	17.12
Pennsylvania	19.14	17.62	11.37	10.40	9.50	10.15	11.34	11.93	12.66	13.75	13.75	17.89	16.33	14.56
N. Atlantic	19.43	17.34	14.14	12.97	11.93	9.66	15.88	15.15	16.27	15.04	15.44	20.15	19.01	18.12
Maryland	16.72	20.90	11.75	13.00	9.00	9.36	13.23	12.95	15.95	14.88	14.57	20.00	20.00	20.00
Virginia	11.74	12.72	11.04	13.26	9.90	11.70	9.88	13.91	15.07	15.40	16.02	18.00	19.63	20.33
S. Atlantic	15.38	13.38	11.31	13.12	9.45	10.87	11.12	13.55	14.66	15.21	15.47	18.57	19.49	20.25
Ohio	19.15	16.57	13.83	12.28	11.61	12.70	15.83	11.65	14.30	11.79	13.80	19.61	17.60	15.81
Indiana	18.40	16.80	11.29	11.07	11.56	12.95	12.88	11.40	14.02	12.60	15.20	13.78	15.00	14.89
Illinois	16.17	13.14	11.32	11.57	12.03	12.99	12.58	12.41	11.65	12.60	12.60	16.08	18.53	14.55
Michigan	18.78	16.56	12.04	11.76	11.23	12.31	14.87	13.10	13.25	12.09	12.79	14.74	15.81	15.07
Wisconsin	19.80	14.21	12.35	11.85	11.22	13.87	15.55	13.30	12.90	12.26	13.82	17.25	17.40	15.68
N. C. E. of Miss. River	18.20	14.92	12.30	11.88	11.29	13.66	15.36	13.13	12.96	12.28	13.71	17.09	17.32	15.60
Minnesota	15.56	12.43	10.29	8.71	8.51	11.61	10.58	9.36	9.00	8.61	9.80	15.08	12.25	11.09
Iowa	14.87	10.17	9.27	8.45	9.77	11.09	9.47	8.42	10.01	7.80	9.90	15.30	13.77	10.12
Missouri	19.46	13.00	10.19	9.11	9.36	9.08	13.75	9.88	12.50	10.12	11.62	13.00	14.50	17.00
N. Dakota	.....	.....	7.92	7.52	2.87	11.28	11.38	7.78	7.87	8.40	8.51	10.61	8.97	9.03
S. Dakota	.....	.....	6.19	7.50	4.43	9.41	11.10	10.36	8.96	8.70	9.28	14.03	12.45	8.78
Nebraska	17.24	7.44	7.49	7.23	5.81	6.56	10.26	8.78	8.49	8.52	8.68	10.40	10.81	9.46
Kansas	15.92	8.45	7.81	6.27	7.10	7.15	6.08	10.85	7.99	7.64	7.76	6.48	8.64	9.54
N. C. W. of Miss. River	15.66	10.10	9.12	8.16	7.31	10.68	10.31	9.04	8.89	8.36	9.24	12.98	11.45	9.80
Kentucky	18.03	16.50	12.48	11.02	15.73	13.77	14.50	13.48	13.34	10.56	14.30	19.00	18.00	18.00
Tennessee	16.38	11.18	9.16	10.38	9.11	11.76	9.76	13.39	14.08	12.31	13.80	11.00	18.00	19.00
Texas	24.60	14.82	9.70	13.21	17.71	11.88	15.34	17.08	22.63	15.84	14.95	12.50	18.75	19.50
Oklahoma	.....	.....	.....	12.13	8.64	10.78	15.12	11.84	12.04	10.40	9.83	9.34	13.33	14.93
S. Central	18.38	15.43	10.82	12.31	14.27	11.23	11.80	13.15	14.58	11.72	11.23	9.90	14.18	15.64
Montana	.....	23.32	15.83	19.01	18.62	22.23	18.87	23.32	18.54	18.48	18.48	23.53	21.56	23.94
Wyoming	.....	.....	.....	18.48	17.60	21.12	18.30	15.34	17.16	18.70	20.10	21.75	22.75	23.00
Colorado	.....	18.53	16.41	15.93	12.40	18.08	15.78	23.36	21.15	17.49	22.14	21.00	21.46	23.77
New Mexico	.....	16.46	14.14	17.29	17.98	20.61	11.43	14.78	21.24	14.49	17.01	18.00	35.00	40.00
Arizona	.....	14.59	14.43	26.65	19.20	19.52	22.93	23.62	31.25	35.64	32.67	27.60	32.31	35.19
Utah	.....	13.83	14.04	17.89	20.07	18.55	18.94	22.13	21.83	19.61	23.16	22.64	24.33	26.38
Nevada	35.48	20.25	17.15	25.80	19.14	23.10	27.44	29.41	25.85	23.80	25.39	33.14	23.12	28.50
Idaho	.....	21.15	14.04	16.85	16.40	21.31	24.54	17.89	23.56	19.20	20.30	25.82	21.73	23.60
Washington	.....	17.02	15.15	16.68	13.03	17.83	20.10	18.95	17.05	18.80	17.89	23.49	17.69	25.28
Oregon	18.62	16.47	12.34	14.80	12.14	14.99	16.59	19.59	16.93	16.12	18.20	23.93	17.11	20.78
California	20.83	14.01	11.24	11.88	7.18	10.66	16.38	15.68	13.62	12.68	14.69	22.54	17.39	19.61
Far Western	21.26	14.46	11.74	13.17	7.91	12.27	17.11	16.61	14.81	14.14	15.61	22.97	18.14	21.07
United States	18.09	13.84	11.03	10.34	8.32	11.57	13.28	12.05	11.40	10.80	11.74	15.86	13.91	13.46

BARLEY—Continued.

Average farm price of barley per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.										Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
Me	82	76	67	62	59	62	67	68	71	71	68	65	78	81	85	92	91	88	78	77
N. H	90	77	69	69	65	67	80	75	84	75	73	64	80	80	87	78	90	88	83	80
Vt	93	78	63	54	52	52	66	61	60	66	54	62	75	70	75	81	88	89	85	77
Mass	98	83	73	65	68	69	...	...	...	...	...	...	...	...	...	...	...	...	...	...
R. I	95	85	76	64	70	77	...	...	...	...	...	...	...	...	...	...	...	...	...	...
N. Y	89	75	67	51	50	51	56	55	55	57	54	55	80	70	69	79	85	80	72	69
Pa	89	79	58	50	49	50	59	54	56	56	55	55	70	63	69	69	73	78	65	67
N. Atlantic	88.7	75.4	66.4	52.3	51.3	52.3	59.1	56.5	56.9	59.3	55.2	56.8	78.4	70.4	71.4	79.5	85.1	82.0	74.0	71.0
Md	80	81	52	53	38	45	52	49	50	64	48	47	60	65	65	65	....	60	..	64
Va	72	81	60	55	38	45	47	54	57	61	55	56	62	69	72	75	76	75	75	71
S. Atlantic	90.5	91.0	58.3	54.2	38.0	45.0	48.4	51.7	54.3	62.0	52.3	52.5	61.3	68.4	70.2	72.8	76.0	70.9	75.0	68.6
Ohio	84	73	56	46	45	43	51	49	50	52	45	46	70	64	67	74	77	68	63	61
Ind	84	74	54	45	45	47	51	46	50	48	45	52	67	65	68	70	77	68	62	63
Ill	70	62	51	43	47	47	53	44	44	43	42	42	67	65	60	67	68	60	55	52
Mich	85	69	56	48	48	47	54	52	52	55	47	49	67	62	66	69	72	70	64	61
Wis	75	58	49	41	40	44	51	46	48	43	41	45	75	58	60	61	70	66	57	56
N. C. E. of Miss. Riv	77.1	63.2	50.4	41.7	41.4	44.4	51.2	46.4	48.2	44.1	41.6	45.3	74.0	58.7	60.6	62.1	70.3	66.1	57.6	56.4
Minn	61	48	42	33	31	38	45	37	37	32	32	35	67	49	51	57	61	55	45	47
Iowa	59	45	41	33	31	37	47	36	36	36	30	35	60	51	53	56	60	56	47	46
Mo	85	66	49	46	42	45	55	55	54	62	44	48	57	63	75	70	71	75	.....	68
N. Dak	...	...	36	32	33	35	40	36	36	28	30	33	58	46	50	51	59	53	45	43
S. Dak	...	...	36	30	29	31	42	38	33	32	29	32	61	47	48	53	58	52	42	45
Nebr	62	37	38	30	30	33	41	33	33	31	31	31	50	46	47	54	55	46	42	43
Kans	65	44	42	32	27	33	45	38	34	37	32	33	54	54	57	64	67	56	53	53
N. C. W. of Miss. Riv	61.9	44.7	40.7	32.4	30.8	36.1	44.3	36.6	35.7	32.0	30.8	33.0	61.5	48.3	50.5	54.9	59.8	53.8	44.8	45.7
Ky	92	74	52	52	43	55	71	56	63	65	44	55	75	72	....	80	75	65	78	76
Tenn	84	75	58	60	64	62	70	61	65	64	57	60	70	73	80	83	84	75	79	79
Tex	98	73	63	65	66	72	88	72	70	73	66	61	73	78	....	82	85	81	84	100
Okla	...	...	...	43	40	32	49	42	44	40	40	33	50	58	54	66	60	45	63	65
S. Central	91.9	74.2	55.5	47.7	57.6	64.1	57.2	47.2	51.1	49.4	46.4	39.7	53.4	61.1	55.0	68.8	64.1	50.5	66.3	69.0
Mon	....	78	58	54	51	48	52	51	58	62	56	56	62	61	75	78	75	90	61	63
Wyo	....	....	.	66	63	55	65	75	72	57	59	64	68	65	70	56	60	80	82	74
Colo	....	82	61	54	55	50	63	60	61	57	53	54	60	65	68	83	85	75	56	66
N. Mex	....	84	64	66	61	62	65	71	64	90	69	63	70	79	85	85	83	90	.....	100
Ariz	....	76	65	81	62	64	68	91	72	93	81	76	78	85	105	100	114	70	98	88
Utah	....	62	53	52	52	55	53	59	59	57	53	54	58	54	75	71	78	75	58	66
Nev	129	90	64	75	60	58	70	80	85	72	70	69	83	77	75	88	94	100	101	75
Idaho	....	75	53	48	46	50	53	53	52	63	48	50	58	53	60	68	77	75	54	59
Wash	....	56	50	44	44	39	41	46	50	49	47	49	58	58	80	68	84	82	63	64
Oreg	64	61	48	50	50	42	49	52	59	59	52	52	57	59	70	75	83	80	64	66
Cal	89	68	53	54	50	43	41	63	61	60	59	54	78	74	75	75	80	72	73	74
Far West	89.7	68.2	53.1	53.1	49.7	43.2	42.9	59.7	59.3	58.9	56.2	53.6	72.0	69.5	75.3	74.6	81.5	74.6	70.2	71.1
United States	79.0	61.8	48.8	41.2	40.3	40.8	45.2	45.9	45.6	42.0	40.3	41.5	66.6	55.4	58.3	61.7	67.0	61.2	53.4	55.2

BARLEY—Continued.

Wholesale prices of barley per bushel, 1896–1909.

Date.	Cincinnati.		Chicago.		St. Louis.		Milwaukee.		San Francisco.	
	Extra No. 3 spring.[a]		No. 3.		Malting, medium to choice.		Extra No. 3.		No. 1 brewing (per cwt.).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*		
1896	35	36	20	40	...	...			$0.76½	$0.95
1897	30	45	22	47	...	...	...		.82½	1.12½
1898	32	54	26½	53	...	...	...		.92½	1.42½
1899	44	56	34	54	...	...	...	...	.85	1.47½
1900	44½	66	34	62	...	...	...	...	.67½	[illegible]
1901	58	70	36	65	50	67	...	...	.73¾	.85
1902	55	74	35	73	48	70	...	...	.80	1.32½
1903	55	71	42	63	48	67	48	63	.90	1.22½
1904	55	69	35	61	42	65	41	61	[b].95	[b]1.15
1905	52	58	36½	55	43	56	41	54	[c]1.02½	[b]1.35
1906.										
January	53	58	38½	55	46	53½	44	54	...	...
February	53	58	38	51	45	52	45	54	...	...
March	53	58	39	53	45	53½	43½	54	...	...
April	55	60	39	53	[c]41½	[c]42	45	55	...	...
May	55	60	42	55½	[c]45	[c]47	45	54	...	...
June	55	60	43	58	[c]47	[c]51	48	56	...	...
July	55	60	40	54	[c]41	[c]45	45½	55	...	...
August	...	...	38	53	[c]36	[c]38	46	54	...	...
September	52	61	38	55	46	57	45	54	...	...
October	52	61	40	56	45	58	46	55	...	...
November	56	62	42	56	46	58	46	55	...	...
December	57	62	44	56	49	58½	49	55	...	...
Year	52	62	38	58	36	58½	43½	56	...	...
1907.										
January	54	60	45	57	50	59	49	57	1.15	1.20
February	57	68	48	63	55	67	52½	65	1.12½	1.20
March	67	71	57	75	63	75	63½	74½	1.15	1.27½
April	69	77	60	74	70	73	66	74½	1.20	1.27½
May	74	92	66	85	80	80	70	85	1.25	1.30
June	90	92	66	76	66	66	68½	79	1.22½	1.27½
July	90	92	55	75	65	65	62	70	1.22½	1.32½
August	88	92	55	87	...	...	63½	87	1.30	1.37½
September	88	113	76	100	88	100	83	108	1.37½	1.55
October	108	113	70	110	80	115	72	111	1.45	1.72½
November	108	113	58	95	71	95	80	100	1.62½	1.72½
December	108	113	78	102	84	102	85	100	1.60	1.67½
Year	54	113	45	110	50	115	49	111	1.12½	1.72½
1908.			Low malting to fancy.						No. 1 feed.	
January	113	115	78	106	84	98	85	105	1.35	1.57½
February	102	115	80	95	82	92	78	95	1.25	1.42½
March	102	110	72	93	...	...	75	90	1.25	1.42½
April	98	110	65	87	...	...	68	86	1.32½	1.42½
May	...	...	60	75	...	...	64	71	1.37½	1.50
June	...	...	49	66	...	...	50	66	1.22½	1.42½
July	...	...	57	74	...	...	60	61	1.25	1.40
August	68	70	60	68	...	...	59	67	1.25	1.38¾
September	67	73	56	67	...	...	56	65½	1.25	1.36¼
October	67	71	53	62	...	...	57	66	1.32½	1.42½
November	67	71	54½	67	60	65	58	65¼	1.40	1.47½
December	67	69	57	64½	...	...	59	65¼	1.40	1.45
Year	67	115	49	106	60	98	50	105	1.22½	1.57½
1909.										
January	67	70	59	66	60	68	62	66	1.36¼	1.43¾
February	70	71	60½	66½	...	...	62	66½	1.37½	1.42½
March	71	72	63	68	...	...	63	67½	1.40	1.50
April	71	72	62	68	...	...	63½	68	1.47½	1.65
May	73	74	66	75	...	...	60	77	1.55	1.70
June	74	84	70	82½	...	...	65	82½	1.40	1.80
July	75	76	62	78	64	70	64½	72	1.42½	1.48¾
August	...	...	50	70	64	70	54	68	1.35	1.45
September	64	68	50	66	64	70	59	68	1.35	1.40
October	64	67	50	66	50	70	55	67	1.35	1.45
November	66	68	53	67½	58	71	60	67	1.43¾	1.47½
December	70	76	55	72	58	74	64	70	1.45	1.52½
Year	64	84	50	82½	50	74	54	82½	1.35	1.70

[a] No. 1 fall, 1896. [b] No. 1 feed. [c] Feed barley.

RYE.

Rye area of countries named, 1905–1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.					
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
United States	1,730,200	2,001,900	1,926,000	1,948,000	2,006,000
Canada:					
Ontario	101,300	79,900	67,200	63,400	57,300
Manitoba	6,900	4,200	6,000	6,300	4,700
Other	(a)	(a)	(a)	30,600	29,300
Total Canada	......	......	......	100,300	91,300
Mexico	(a)	(a)	(a)	(a)	(a)
EUROPE.					
Austria-Hungary:					
Austria	4,864,600	4,992,800	4,580,300	5,139,100	5,134,700
Hungary proper	2,600,000	2,624,800	2,400,900	2,575,900	2,485,700
Croatia-Slavonia	190,900	175,700	171,500	175,100	172,100
Bosnia-Herzegovina	(a)	41,900	37,700	31,100	28,200
Total Austria-Hungary	......	7,835,200	7,250,400	7,920,300	7,820,700
Belgium	659,700	624,900	641,800	632,600	(a)
Bulgaria	434,200	461,700	450,800	429,300	(a)
Denmark	679,400	680,700	682,000	682,000	677,100
Finland	(a)	(a)	(a)	(a)	(a)
France	3,136,900	3,095,100	3,064,300	3,074,800	3,067,800
Germany	15,186,000	15,077,200	14,931,500	15,122,600	15,149,300
Italy	(a)	(a)	(a)	(a)	(a)
Netherlands	541,700	539,200	544,600	548,800	......
Norway	(a)	(a)	37,100	37,100	37,200
Roumania	398,300	454,500	362,400	363,400	337,500
Russia:					
Russia proper	64,689,600	66,638,400	65,681,900	63,009,500	(b)
Poland	5,057,900	5,180,600	5,238,000	5,130,100	(b)
Northern Caucasia	659,200	735,000	683,200	553,300	(b)
Total Russia (European)	70,406,700	72,554,000	71,603,100	68,692,900	......
Servia	117,500	120,200	109,800	117,800	(a)
Spain	1,854,200	2,190,700	2,228,100	2,246,800	2,058,600
Sweden	1,014,000	1,015,300	1,005,900	(a)	(a)
United Kingdom	72,400	75,200	70,100	60,800	63,000
ASIA.					
Russia:					
Central Asia	51,700	35,000	65,200	54,200	(b)
Siberia	2,367,400	2,395,300	2,609,100	2,265,400	(b)
Transcaucasia	1,200	1,200	1,200	1,100	(b)
Total Russia (Asiatic)	2,420,300	2,431,500	2,675,500	2,320,700	......
AUSTRALASIA.					
Australia:					
Queensland	200	100	100	100	(a)
New South Wales	3,500	4,400	6,700	5,300	4,700
Victoria	2,300	2,000	1,600	1,400	2,000
Western Australia	400	500	600	600	600
Tasmania	700	500	700	700	(a)
New Zealand	1,100	1,400	1,300	3,000	3,500
Total Australasia	8,200	8,900	11,000	11,100	......

[a] No official statistics of area; estimates of production on p. 477.
[b] No detailed official data of either area or production.

RYE—Continued.

Rye crop of countries named, 1905-1909.

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	28,486,000	33,375,000	31,566,000	31,851,000	32,239,000
Canada:					
Ontario	1,715,000	1,327,000	1,039,000	1,030,000	1,097,000
Manitoba	173,000	101,000	84,000	101,000	75,000
Other	500,000	500,000	371,000	580,000	543,000
Total Canada	2,388,000	1,928,000	1,494,000	1,711,000	1,715,000
Mexico	70,000	70,000	70,000	70,000	70,000
Total	30,944,000	35,373,000	33,130,000	33,632,000	34,024,000
EUROPE.					
Austria-Hungary:					
Austria	98,186,000	99,246,000	86,452,000	113,309,000	114,433,000
Hungary proper	50,544,000	51,962,000	39,445,000	45,185,000	44,858,000
Croatia-Slavonia	2,537,000	1,918,000	2,136,000	2,520,000	2,393,000
Bosnia-Herzegovina	374,000	388,000	271,000	298,000	368,000
Total Austria-Hungary	151,641,000	153,514,000	128,304,000	161,312,000	162,052,000
Belgium	21,349,000	20,569,000	23,484,000	21,849,000	20,000,000
Bulgaria	7,113,000	7,538,000	3,883,000	5,604,000	5,000,000
Denmark	19,249,000	18,828,000	15,893,000	19,170,000	18,000,000
Finland	11,552,000	11,927,000	11,000,000	12,000,000	11,000,000
France	58,116,000	50,429,000	55,896,000	51,703,000	56,643,000
Germany	378,204,000	378,948,000	384,150,000	422,692,000	446,767,000
Italy	4,000,000	4,000,000	4,000,000	3,000,000	3,000,000
Netherlands	13,742,000	13,938,000	14,483,000	15,866,000	15,000,000
Norway	982,000	963,000	823,000	848,000	988,000
Roumania	7,344,000	8,900,000	2,554,000	2,640,000	3,000,000
Russia:					
Russia proper	629,671,000	555,698,000	693,257,000	673,736,000	....
Poland	69,088,000	74,100,000	74,127,000	77,954,000	....
Northern Caucasia	9,933,000	8,877,000	6,807,000	6,993,000	....
Total Russia (European)	708,692,000	638,675,000	774,191,000	758,683,000	877,168,000
Servia	1,103,000	1,560,000	911,000	974,000	1,500,000
Spain	26,502,000	30,918,000	27,027,000	26,412,000	34,991,000
Sweden	24,393,000	25,915,000	22,001,000	26,052,000	25,728,000
United Kingdom	1,956,000	2,073,000	1,895,000	1,776,000	1,954,000
Total	1,435,938,000	1,368,695,000	1,470,495,000	1,530,581,000	1,682,791,000
ASIA.					
Russia:					
Central Asia	690,000	404,000	993,000	564,000	....
Siberia	28,043,000	27,752,000	32,931,000	22,775,000	....
Transcaucasia	17,000	13,000	12,000	9,000	....
Total Russia (Asiatic)	28,750,000	28,169,000	33,936,000	23,348,000	19,667,000
AUSTRALASIA.					
Australia:					
Queensland	2,000	1,000	3,000	1,000	1,000
New South Wales	35,000	50,000	98,000	56,000	51,000
Victoria	32,000	30,000	21,000	22,000	33,000
Western Australia	5,000	4,000	5,000	5,000	4,000
Tasmania	12,000	8,000	15,000	15,000	18,000
Total Australia	86,000	93,000	142,000	99,000	107,000
New Zealand	33,000	65,000	43,000	73,000	94,000
Total Australasia	119,000	158,000	185,000	172,000	201,000
Grand total	*1,495,751,000*	*1,432,395,000*	*1,537,746,000*	*1,587,733,000*	*1,736,083,000*

RYE—Continued.

Acreage, production, value, prices, and exports of rye in the United States, 1849–1909.

Year.	Acreage.	Average yield per acre.	Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.	Chicago cash price per bushel, No. 2. December. Low.	December. High.	May of following year. Low.	May of following year. High.	Domestic exports, including rye flour, fiscal year beginning July 1.
	Acres.	*Bush.*	*Bushels.*	*Cents.*	*Dollars.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Bushels.*
1849 a	......	....	14,189,000	......	......	......	......	......	......	......
1859 a	......	....	21,101,000	......	......	......	......	......	......	......
1866	1,548,000	13.5	20,865,000	82.2	17,150,000	......	......	142	150	234,971
1867	1,689,000	13.7	23,184,000	100.4	23,281,000	132	157	173	185	564,901
1868	1,651,000	13.6	22,505,000	94.9	21,349,000	106½	118	100	115½	92,869
1869	1,658,000	13.6	22,528,000	77.0	17,342,000	66	77½	78	83½	199,450
1870	1,176,000	13.2	15,474,000	73.2	11,327,000	67	74	81	91	87,174
1871	1,070,000	14.4	15,366,000	71.1	10,928,000	62	63¾	75	93	832,689
1872	1,049,000	14.2	14,889,000	67.6	10,071,000	57½	70	68½	70	611,749
1873	1,150,000	13.2	15,142,000	70.3	10,638,000	70	81	91	102	1,923,404
1874	1,117,000	13.4	14,991,000	77.4	11,610,000	93	99½	103	107½	267,058
1875	1,360,000	13.0	17,722,000	67.1	11,894,000	67	68¾	61½	70½	589,159
1876	1,468,000	13.9	20,375,000	61.4	12,505,000	65½	73	70	92½	2,234,856
1877	1,413,000	15.0	21,170,000	57.6	12,202,000	55½	56½	54	60	4,249,684
1878	1,623,000	15.9	25,843,000	52.5	13,566,000	44	44½	47	52	4,877,821
1879	1,625,000	14.5	23,639,000	65.6	15,507,000	73½	81	73½	85	2,943,894
1880	1,768,000	13.9	24,541,000	75.6	18,565,000	82	91½	115	118	1,955,155
1881	1,789,000	11.6	20,705,000	93.3	19,327,000	96½	98	77	83	1,003,609
1882	2,228,000	13.4	29,960,000	61.5	18,439,000	57	58½	62	67	2,206,212
1883	2,315,000	12.1	28,059,000	58.1	16,301,000	56½	60	60½	62½	6,247,590
1884	2,344,000	12.2	28,640,000	51.9	14,857,000	51	52	68	73	2,974,390
1885	2,129,000	10.2	21,756,000	57.9	12,595,000	58½	61	58	61	216,699
1886	2,130,000	11.5	24,489,000	53.8	13,181,000	53	54½	54½	56½	377,302
1887	2,053,000	10.1	20,693,000	54.5	11,283,000	55½	61½	63	68	94,827
1888	2,365,000	12.0	28,415,000	58.8	16,722,000	50	52	39	41½	309,266
1889	2,171,000	13.1	28,420,000	42.3	12,010,000	44	45½	49½	54	2,280,975
1890	2,142,000	12.0	25,807,000	62.9	16,230,000	64½	68½	83	92	358,263
1891	2,176,000	14.6	31,752,000	77.4	24,589,000	86	92	70¼	79	12,068,628
1892	2,164,000	12.9	27,979,000	54.2	15,160,000	46	51	50¼	62	1,493,924
1893	2,038,000	13.0	26,555,000	51.3	13,612,000	45	47½	44½	48	249,152
1894	1,945,000	13.7	26,728,000	50.1	13,395,000	47½	49	62½	67	32,045
1895	1,890,000	14.4	27,210,000	44.0	11,965,000	32	35¾	33	36½	1,011,128
1896	1,831,000	13.3	24,369,000	40.9	9,961,000	37	42½	32¾	35½	8,575,663
1897	1,704,000	16.1	27,363,000	44.7	12,240,000	45¾	47	48	75	15,562,035
1898	1,643,000	15.6	25,658,000	46.3	11,875,000	52½	55½	56½	62	10,169,822
1899	1,659,000	14.4	23,962,000	51.0	12,214,000	49	52	53	56¼	2,382,012
1900	1,591,000	15.1	23,996,000	51.2	12,295,000	45¾	49¾	51½	54	2,345,512
1901	1,988,000	15.3	30,345,000	55.7	16,910,000	59	65¾	54½	58	2,712,077
1902	1,979,000	17.0	33,631,000	50.8	17,081,000	48	49¾	48	50½	5,445,273
1903	1,907,000	15.4	29,363,000	54.5	15,994,000	50½	52½	69¾	78	784,068
1904	1,793,000	15.2	27,242,000	68.8	18,748,000	73	75	70	84	29,749
1905	1,730,000	16.5	28,486,000	61.1	17,414,000	64	68	58	62	1,387,826
1906	2,002,000	16.7	33,375,000	58.9	19,671,000	61	65	69	87½	769,717
1907	1,926,000	16.4	31,566,000	73.1	23,068,000	75	82	79	86	2,444,588
1908	1,948,000	16.4	31,851,000	73.6	23,455,000	75	77½	83	90	1,295,692
1909	2,006,000	16.1	32,239,000	73.9	23,809,000	72	80	......	......	......

a Census figures.

RYE—Continued.

Acreage, production, and value of rye in the United States in 1909.

State, Territory, or Division.	Acreage.	Production.	Farm value Dec. 1.	State, Territory, or Division.	Acreage.	Production.	Farm value Dec. 1.
	Acres.	*Bushels.*	*Dollars.*		*Acres.*	*Bushels.*	*Dollars.*
Vermont	2,000	31,000	31,000	Missouri	15,000	225,000	184,000
Massachusetts	4,000	65,000	68,000	North Dakota	26,000	478,000	272,000
Connecticut	10,000	187,000	168,000	South Dakota	33,000	578,000	343,000
New York	160,000	2,720,000	2,176,000	Nebraska	80,000	1,320,000	805,000
New Jersey	79,000	1,288,000	1,018,000	Kansas	40,000	568,000	426,000
Pennsylvania	360,000	5,508,000	4,406,000				
N. Atlantic	615,000	9,799,000	7,867,000	N. Central W. of Miss. R.	367,000	6,392,000	3,990,000
Delaware	1,000	14,000	10,000	Kentucky	13,000	165,000	145,000
Maryland	20,000	282,000	220,000	Tennessee	8,000	86,000	83,000
Virginia	15,000	184,000	155,000	Alabama	2,000	23,000	31,000
West Virginia	11,000	148,000	133,000	Texas	4,000	45,000	55,000
North Carolina	13,000	122,000	126,000	Oklahoma	4,000	54,000	50,000
South Carolina	4,000	39,000	55,000	Arkansas	2,000	21,000	22,000
Georgia	14,000	126,000	189,000				
S. Atlantic	78,000	915,000	888,000	S. Central	33,000	394,000	386,000
Ohio	57,000	980,000	745,000	Montana	2,000	58,000	44,000
Indiana	57,000	940,000	696,000	Wyoming	1,000	26,000	23,000
Illinois	71,000	1,264,000	935,000	Colorado	4,000	88,000	64,000
Michigan	350,000	5,425,000	3,743,000	Utah	3,000	66,000	46,000
Wisconsin	290,000	4,727,000	3,214,000	Idaho	4,000	86,000	60,000
				Washington	4,000	81,000	79,000
				Oregon	9,000	153,000	153,000
N. Central E. of Miss. R.	825,000	13,336,000	9,333,000	California	61,000	842,000	876,000
				Far Western	88,000	1,403,000	1,345,000
Minnesota	120,000	2,280,000	1,368,000				
Iowa	53,000	943,000	594,000	United States	2,006,000	32,239,000	23,806,000

Condition of the rye crop in the United States on the first of months named, 1888–1910.

Year.	December of previous year.	April.	May.	June.	July.	August.	When harvested.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1888	96.0	93.5	92.9	93.9	95.1	91.4	92.8
1889	97.2	93.9	96.5	95.2	96.7	95.4	91.6
1890	96.4	92.8	93.5	92.3	92.0	86.8	85.4
1891	99.0	95.4	97.2	95.4	93.9	89.6	95.1
1892	88.8	87.0	88.9	91.0	92.8	89.8	88.5
1893	89.4	85.7	82.7	84.6	85.3	78.5	82.0
1894	94.6	94.4	90.7	93.2	87.0	79.8	86.9
1895	96.2	87.0	88.7	85.7	80.7	84.0	83.7
1896	94.9	82.9	87.7	85.2	88.4	88.0	82.0
1897	99.8	88.9	88.0	89.9	93.4	89.8	90.1
1898	91.0	92.1	94.5	97.1	94.6	93.7	89.4
1899	98.9	84.9	85.2	84.5	84.9	89.0	82.0
1900	98.2	84.8	88.5	87.6	84.0	76.0	84.2
1901	99.1	93.1	94.6	93.9	93.5	83.6	84.9
1902	89.9	85.4	83.4	88.1	91.2	90.5	90.2
1903	98.1	97.9	93.3	90.6	90.2	87.2	84.1
1904	92.7	82.3	81.2	86.3	89.0	91.8	86.9
1905	90.5	92.1	93.5	93.6	92.9	92.6	90.8
1906	95.4	90.9	92.9	89.9	91.3	90.8	90.5
1907	96.2	92.0	88.0	88.1	89.7	88.9	....
1908	91.4	89.1	90.3	91.3	91.2	88.3	....
1909	87.6	87.2	88.1	89.6	91.4	89.1	....
1910	94.1	....	....	....	....	....	....

RYE—Continued.

Average yield per acre of rye in the United States.

State, Territory, or Division.	10-year averages. 1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	16.6	14.2	13.4	16.3	17.2	....	....	....	....	....	....	....	....	....
New Hampshire	17.0	12.5	13.4	.....	17.1	....	....	....	....	....	....	....	....	....
Vermont	16.5	15.9	13.8	17.4	16.6	18.3	16.9	19.4	16.9	15.0	17.4	17.0	15.0	15.5
Massachusetts	16.6	15.1	14.3	16.8	16.9	15.9	15.2	13.7	17.0	15.5	15.0	16.5	16.5	16.2
Connecticut	14.1	14.1	13.7	17.5	17.0	18.0	17.4	17.0	16.9	18.0	18.0	17.0	18.5	18.7
New York	14.2	13.0	13.6	16.0	15.1	14.9	17.5	15.2	14.8	16.0	17.6	16.5	16.5	17.0
New Jersey	13.7	11.8	12.1	15.8	15.9	15.0	16.4	13.8	17.5	18.0	17.2	17.5	16.2	16.3
Pennsylvania	13.6	12.0	12.6	16.1	15.3	15.9	16.0	15.6	15.5	17.0	17.4	16.7	16.5	15.3
North Atlantic	14.0	12.5	13.0	16.1	15.4	15.6	16.5	15.3	15.6	16.9	17.4	16.8	16.5	15.9
Delaware	9.0	10.9	8.0	13.1	15.5	15.3	13.5	14.8	11.8	10.0	15.0	16.5	15.5	14.0
Maryland	11.9	11.8	11.1	14.3	16.5	14.4	14.0	13.7	14.8	14.5	14.7	16.0	15.0	14.1
Virginia	10.1	7.9	8.2	11.2	10.5	11.1	9.6	12.2	15.7	11.8	13.4	14.0	12.5	12.3
West Virginia	13.0	10.2	9.3	11.0	10.5	12.0	8.1	11.5	12.5	11.8	12.2	12.0	13.0	13.5
North Carolina	8.8	7.0	6.4	8.6	8.9	8.5	8.2	8.8	9.9	9.5	11.0	10.5	8.9	9.4
South Carolina	6.2	5.0	5.6	7.1	7.5	7.7	7.6	7.6	7.5	8.1	8.5	10.0	9.6	9.8
Georgia	7.2	5.6	5.8	7.3	7.0	7.6	6.3	7.9	8.3	7.7	8.3	9.0	8.7	9.0
South Atlantic	10.4	8.0	8.0	10.6	10.6	10.7	9.5	10.9	12.4	11.1	12.0	12.5	11.7	11.7
Ohio	12.6	13.2	14.3	16.1	16.6	16.9	17.5	15.3	16.1	18.0	19.5	17.2	16.5	17.2
Indiana	14.0	12.4	13.9	13.9	15.1	14.5	14.5	12.6	14.6	15.4	17.0	17.0	15.0	16.5
Illinois	16.1	16.3	14.7	16.6	17.2	17.0	19.1	16.5	17.6	18.0	17.0	18.5	17.1	17.8
Michigan	15.6	13.0	13.4	14.5	14.6	14.0	17.9	15.5	13.2	16.0	14.5	14.5	15.5	15.5
Wisconsin	15.9	14.6	14.0	16.1	15.8	15.8	18.9	16.6	16.2	16.5	17.0	18.0	19.0	16.3
North Central East of Mississippi River	15.3	15.0	14.1	15.6	15.9	15.5	18.4	16.0	15.6	16.6	16.0	16.3	16.8	16.2
Minnesota	18.7	16.6	16.1	18.7	19.5	19.3	22.3	18.4	17.7	18.2	19.3	18.5	18.5	19.0
Iowa	18.4	13.4	15.3	17.6	18.0	18.4	17.4	16.9	17.2	17.5	18.6	17.8	20.0	17.8
Missouri	16.3	13.4	12.7	13.9	11.0	14.2	18.2	12.8	14.4	15.5	15.8	15.4	12.8	15.0
North Dakota	...	.....	13.9	14.9	5.2	13.8	20.2	15.7	18.5	19.5	18.7	16.0	18.0	18.4
South Dakota	...	.....	10.0	15.9	10.6	14.4	18.8	20.2	16.5	19.0	18.8	17.0	17.5	17.5
Nebraska	19.6	15.3	12.0	16.6	14.2	15.0	20.3	14.2	15.8	18.0	21.0	17.0	16.0	16.5
Kansas	19.3	17.4	11.0	13.4	15.2	14.3	12.0	16.2	13.2	15.7	16.0	12.0	13.3	14.2
North Central West of Mississippi River.	17.5	14.5	10.9	16.5	15.9	16.1	18.6	16.2	16.1	17.6	18.8	16.6	17.0	17.4
Kentucky	11.0	10.3	10.8	12.8	13.1	14.0	13.4	11.6	13.7	15.0	15.2	13.7	13.5	12.7
Tennessee	9.6	7.5	7.4	10.9	11.0	11.3	11.0	13.4	11.7	12.1	13.0	10.0	12.5	10.7
Alabama	8.6	5.4	7.9	9.5	7.8	8.0	10.0	10.6	10.4	11.7	12.5	10.5	10.0	11.3
Texas	15.9	12.9	9.0	12.0	16.5	11.1	9.9	14.2	13.1	14.0	14.6	10.0	15.5	11.2
Oklahoma	.....	.....	.....	14.0	19.0	14.8	16.0	17.9	9.4	12.1	13.9	10.0	13.5	13.5
Arkansas	13.0	8.9	8.0	10.9	11.5	8.7	12.3	9.7	11.1	12.0	12.0	9.9	10.0	10.5
South Central	10.9	9.4	9.4	11.9	12.5	12.3	12.3	12.9	12.2	13.3	14.0	11.2	13.1	11.9
Montana	.....	.....	.....	23.2	23.0	26.7	25.0	24.6	19.9	20.0	20.5	22.0	20.0	29.0
Wyoming	.....	.....	.....	20.5	18.3	24.0	18.0	18.0	19.5	23.0	19.0	21.5	22.0	26.0
Colorado	.....	17.9	16.1	17.6	16.8	16.1	15.9	18.3	19.1	19.0	20.0	20.5	15.5	22.0
Utah	.....	10.2	13.9	16.3	17.5	14.2	12.4	16.1	16.0	18.0	24.0	20.0	15.5	22.0
Idaho	.....	.....	12.5	19.7	18.0	15.0	20.2	18.5	19.7	25.0	25.2	24.7	20.0	21.5
Washington	.....	16.1	15.3	17.9	16.3	17.5	17.8	21.0	19.0	18.5	19.6	21.5	19.5	21.0
Oregon	24.7	18.3	12.8	14.2	16.1	15.7	13.4	14.2	14.4	15.0	17.2	16.0	18.0	17.0
California	22.2	12.4	12.6	12.1	13.0	12.8	12.0	12.3	7.6	13.0	12.8	19.0	12.0	13.8
Far Western	22.5	12.9	13.2	13.3	14.0	13.9	12.9	13.5	9.9	14.1	14.7	19.0	13.4	15.9
United States	13.6	13.3	12.7	15.4	15.1	15.3	17.0	15.4	15.2	16.5	16.7	16.4	16.4	16.1

RYE—Continued.

Average farm value per acre of rye in the United States December 1.

State, Territory, or Division.	10-year averages. 1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	18.09	13.63	11.66	13.04	14.10	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. Hampshire	17.85	11.19	10.99	13.75	14.02	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vermont	16.83	13.20	10.07	11.66	10.13	14.64	13.01	12.61	12.51	9.75	10.79	12.78	13.50	15.50
Massachusetts	16.93	12.84	11.02	12.43	12.68	12.56	12.46	10.00	13.94	12.25	9.75	14.87	15.75	17.00
Connecticut	15.12	11.98	9.86	11.90	11.05	12.96	13.05	12.07	13.35	13.32	11.88	13.77	16.60	16.80
New York	12.21	9.49	8.57	9.28	8.46	9.24	10.15	9.27	10.80	10.72	11.44	13.36	13.37	13.60
New Jersey	12.33	8.85	7.81	9.16	8.74	8.85	10.00	8.83	12.25	11.88	10.49	13.30	13.13	12.89
Pennsylvania	11.15	8.76	7.56	8.86	8.11	9.54	8.48	9.67	11.01	11.05	11.14	12.52	12.71	12.24
N. Atlantic	*12.04*	*9.30*	*8.09*	*9.16*	*8.46*	*9.48*	*9.20*	*9.53*	*11.17*	*11.13*	*11.12*	*12.89*	*13.02*	*12.79*
Delaware	7.47	7.52	4.96	8.38	7.75	8.87	8.37	9.03	8.61	6.60	9.00	11.00	13.00	10.00
Maryland	9.52	8.26	6.55	8.15	8.58	8.06	8.12	8.08	11.25	9.43	8.82	11.98	11.53	11.00
Virginia	7.27	5.29	4.92	6.61	6.09	6.77	6.34	8.05	11.62	8.38	9.38	11.22	10.27	10.33
W. Virginia	10.27	7.14	5.95	7.04	6.72	7.80	5.51	8.17	9.63	8.26	8.54	9.91	11.00	12.00
N. Carolina	7.83	5.53	4.99	6.62	6.76	6.63	6.97	7.39	8.61	8.17	9.35	10.21	8.71	9.69
S. Carolina	8.37	6.15	5.43	7.53	7.87	8.55	8.59	8.13	9.45	9.64	10.63	12.63	13.00	13.75
Georgia	9.36	6.66	5.63	7.66	7.21	8.06	6.93	9.01	8.47	8.39	8.72	11.24	10.86	13.50
S. Atlantic	*8.60*	*6.16*	*5.36*	*7.00*	*7.00*	*7.37*	*6.96*	*8.08*	*10.00*	*8.61*	*9.07*	*11.12*	*10.64*	*11.38*
Ohio	9.20	8.58	8.01	8.69	9.13	9.30	9.27	8.87	11.91	11.16	11.12	12.91	12.53	13.07
Indiana	9.52	8.06	7.23	6.95	7.55	7.68	6.67	6.68	10.07	9.23	9.86	12.23	11.49	12.21
Illinois	9.34	9.45	7.35	8.30	8.08	9.69	9.55	8.58	12.32	10.80	9.52	13.13	12.48	15.17
Michigan	11.23	8.32	7.24	7.25	7.01	7.28	8.77	7.90	9.50	9.41	8.56	10.44	11.01	10.69
Wisconsin	9.54	8.47	7.00	7.89	7.74	8.27	9.45	8.30	11.18	9.73	9.86	12.96	13.49	11.08
N. C. E. of Miss. R	9.52	8.85	7.26	7.74	7.77	8.18	9.11	8.15	10.88	9.81	9.30	11.75	12.05	11.31
Minnesota	9.91	8.63	7.24	8.23	8.19	9.46	9.59	8.28	11.33	9.65	9.65	12.21	11.66	11.40
Iowa	9.02	6.83	6.88	7.74	7.58	9.20	7.31	7.44	10.32	9.27	9.30	11.39	12.79	11.21
Missouri	10.27	7.64	6.22	7.51	7.11	9.51	8.74	7.04	9.22	9.61	9.48	11.10	9.73	12.27
N. Dakota	.....	.....	5.84	6.11	2.13	5.93	8.69	6.75	11.10	9.75	8.79	9.58	11.71	10.46
S. Dakota	.....	.....	4.20	6.36	4.13	6.19	7.71	8.08	9.11	9.31	8.46	10.52	10.41	10.33
Nebraska	10.78	6.27	4.80	6.47	5.68	6.90	7.31	5.25	8.69	8.64	9.24	10.02	9.60	10.06
Kansas	11.97	7.48	4.84	6.16	6.54	7.87	5.40	7.13	8.58	8.48	8.00	7.91	9.44	10.65
N. C. W. of Miss. R	*9.90*	*7.21*	*4.79*	*7.05*	*6.67*	*7.92*	*7.58*	*6.83*	*9.67*	*9.07*	*9.05*	*10.52*	*10.80*	*10.87*
Kentucky	8.47	7.11	6.70	8.19	8.25	9.38	8.31	8.00	10.96	10.65	10.64	11.87	11.54	11.15
Tennessee	7.97	6.52	5.03	7.41	7.48	8.36	8.03	9.92	9.24	9.32	9.62	8.78	11.25	10.38
Alabama	11.09	6.43	7.82	10.16	8.03	8.32	10.50	11.45	12.48	13.34	13.12	13.12	12.50	15.50
Texas	16.54	11.48	6.93	9.24	11.05	10.32	7.52	10.51	11.27	11.90	12.41	10.00	15.25	13.75
Oklahoma	.....	.....	.....	8.26	8.36	10.36	7.52	8.95	5.83	7.50	7.92	7.39	10.67	12.50
Arkansas	14.69	7.92	6.00	8.50	8.28	7.74	8.98	8.15	9.77	11.16	9.96	8.82	9.50	11.00
S. Central	8.79	7.06	6.22	8.09	8.30	9.05	8.20	9.18	9.88	10.30	10.42	10.08	11.81	11.70
Montana	.....	.....	.....	15.31	12.19	16.02	16.00	15.50	15.32	13.00	13.53	15.24	13.50	22.00
Wyoming	.....	.....	.....	12.30	9.70	19.20	9.00	12.42	7.80	14.26	13.68	15.00	16.00	23.00
Colorado	.....	13.78	9.98	10.03	9.07	9.98	8.90	11.16	12.41	10.64	11.20	12.61	10.67	16.00
Utah	.....	6.94	7.51	9.29	9.10	9.23	7.56	10.46	10.72	11.70	15.66	12.89	10.00	15.33
Idaho	.....	8.64	7.38	12.80	15.84	10.05	12.12	12.02	14.77	14.00	15.12	15.29	13.50	15.00
Washington	.....	12.46	10.40	11.46	9.45	10.85	11.39	15.12	15.01	12.95	12.74	16.55	17.33	19.75
Oregon	21.00	14.64	8.45	10.37	9.82	10.36	9.78	13.77	12.82	12.15	12.73	13.17	15.33	17.00
California	25.31	10.91	8.57	8.47	7.54	7.30	9.00	9.47	5.93	10.01	9.09	16.16	10.56	14.36
Far Western	*24.75*	*10.93*	*8.63*	*9.18*	*8.05*	*8.27*	*9.30*	*10.44*	*7.76*	*10.58*	*10.21*	*15.54*	*11.32*	*15.28*
United States	10.62	8.45	6.97	8.08	7.73	8.51	8.63	8.39	10.40	10.07	9.83	11.98	12.04	11.87

RYE—Continued.

Average farm price of rye per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900	1901	1902	1903	1904	1905	1906	1907	1908	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
Maine	109	96	87	80	82	....	....	....	....	....	....	....	....	....	....	....	....	....	....
New Hampshire	105	91	82	79	82	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Vermont	102	83	73	67	61	80	77	65	74	65	62	78	90	....	85	....	....	....	100
Massachusetts	102	85	76	74	75	79	80	73	82	79	65	90	95	..	101	105	100	100	105
Connecticut	105	85	72	68	65	72	75	71	79	74	66	81	90	90	88	100	95	92	90
New York	86	73	63	58	56	62	58	61	73	67	65	81	81	82	86	89	86	82	80
New Jersey	90	75	63	58	55	59	61	64	70	66	61	76	81	82	81	85	88	80	79
Pennsylvania	82	73	60	55	53	60	53	62	71	65	64	75	77	78	81	84	86	80	80
North Atlantic	86.0	74.4	62.2	56.9	55.1	60.8	55.9	62.2	71.6	65.9	63.9	76.7	78.9	79.8	82.5	85.8	86.5	81.0	80.3
Delaware	83	69	62	64	50	58	62	61	73	66	64	80	82	75	78	85	75	70	75
Maryland	80	70	59	57	52	56	58	59	76	65	60	75	77	76	79	78	76	79	78
Virginia	72	67	60	59	58	61	66	66	74	71	70	80	82	80	84	86	85	81	84
West Virginia	79	70	64	64	64	65	68	71	77	70	70	82	85	88	88	92	90	89	90
North Carolina	89	79	78	77	76	78	85	84	87	86	85	97	98	97	99	102	100	102	103
South Carolina	135	123	97	106	105	111	113	107	126	119	125	125	137	114	138	128	130	150	141
Georgia	130	119	97	105	103	106	110	114	102	109	105	125	125	145	145	140	150	162	150
South Atlantic	82.7	77.0	67.0	66.0	66.3	69.0	73.0	73.9	81.2	77.5	75.6	89.0	90.9	92.3	95.4	95.8	95.2	96.7	97.0
Ohio	73	65	56	54	55	55	53	58	74	63	57	75	76	76	80	84	80	75	76
Indiana	68	65	52	50	50	53	46	53	69	60	58	72	74	73	77	82	76	73	74
Illinois	58	58	50	50	47	57	50	52	70	60	56	71	73	74	75	80	77	76	74
Michigan	72	64	54	50	48	52	49	51	72	59	59	72	71	70	75	78	75	66	69
Wisconsin	60	58	50	49	49	52	50	50	69	59	58	72	71	69	72	78	75	68	68
N. C. E. of Miss. River	62.2	59.0	51.5	49.6	49.0	52.8	49.6	50.8	69.9	59.3	58.2	72.1	71.7	70.5	74.3	78.8	75.5	68.7	70.0
Minnesota	53	52	45	44	42	49	43	45	64	53	50	66	63	62	68	75	69	59	60
Iowa	49	51	45	44	41	50	42	44	60	53	50	64	64	66	70	75	72	65	63
Missouri	63	57	49	54	51	67	48	55	64	62	60	72	76	75	81	86	80	84	82
North Dakota	....	....	42	41	41	43	43	43	60	50	47	60	65	60	63	71	63	55	57
South Dakota	....	....	42	40	39	43	41	40	57	49	45	62	59	57	63	70	61	57	59
Nebraska	55	41	40	39	40	46	36	37	55	48	44	59	60	62	65	70	62	59	61
Kansas	62	43	44	46	43	55	45	44	65	54	50	66	71	75	80	82	75	74	75
N. C. W. of Miss. River	56.6	49.7	43.9	42.7	41.9	49.2	40.7	42.2	60.0	51.4	48.1	63.4	63.5	63.8	68.5	74.1	67.7	61.9	62.4
Kentucky	77	69	62	64	63	67	62	69	80	71	70	86	85	85	87	91	85	86	88
Tennessee	83	87	68	68	68	74	73	74	79	77	74	88	90	85	93	94	90	93	96
Alabama	129	119	99	107	103	104	105	108	120	114	105	125	123	120	125	115	....	141	136
Texas	104	89	77	77	67	93	76	74	86	85	85	100	98	98	101	94	99	113	123
Oklahoma	....	....	....	59	44	70	47	50	62	62	57	74	80	75	87	80	85	117	93
Arkansas	113	89	75	78	72	89	73	84	88	93	83	90	94	90	90	87	100	103	105
South Central	80.6	75.1	66.2	68.0	66.1	73.7	66.9	70.9	80.9	77.3	74.6	90.0	90.2	88.0	92.6	91.9	89.1	97.6	98.0
Montana	....	....	....	66	53	60	64	63	77	65	66	68	68	80	77	100	95	66	75
Wyoming	....	....	....	60	53	80	50	69	40	62	72	66	71	84	75	75	90	105	90
Colorado	....	77	62	57	54	62	56	61	65	56	56	62	70	76	79	88	80	71	73
Utah	....	68	54	57	52	65	61	65	67	65	65	65	65	60	78	75	75	62	70
Idaho	....	67	59	65	88	67	60	65	75	56	60	63	68	70	76	90	84	62	70
Washington	....	76	68	64	58	62	64	72	79	70	65	77	90	90	95	110	105	105	94
Oregon	85	80	66	73	61	66	73	97	89	81	74	82	85	88	106	105	110	92	100
California	114	88	68	70	58	57	75	77	78	77	71	85	88	100	94	88	80	80	104
Far Western	110.0	84.7	65.4	69.0	57.7	59.6	72.1	77.3	78.1	74.8	69.7	81.8	84.5	93.5	92.9	91.0	85.8	81.0	95.9
United States	78.1	63.5	54.9	52.5	51.2	55.7	50.8	54.5	68.8	61.1	58.9	73.1	73.6	73.8	77.3	81.2	78.5	72.8	73.9

RYE—Continued.

Wholesale prices of rye per bushel, 1896-1909.

Date.	Philadelphia.		Cincinnati. No. 2.		Chicago. No. 2.		Duluth.		San Francisco (per cwt.).	
	Low.	High.	Low.	High.	Low	High	Low.	High.	Low.	High.
	Cents.	Cents.	Cents	Cents.	Cents.	Cents.	Cents	Cents.		
	......	......	26½	44	28	43	28½	40		...
	......	......	33	52	31	56	30	53	...	...
	......	......	40	80	41	75	40½	72		...
	......	......	50	68	49	62	47	59½		...
	......	......	51½	67	44¼	60¼	46	60¾		
	58	71½	45	73	40¾	65¾	46½	62½	$0.75	$0.87½
	54	71	51	71½	48	67½	46	64	.77½	1.15
	56	68¾	54	63	48	60	48	55½	1.10	1.30
	65	96	61	87	51	81	54½	80	1.25	1.47½
	63	90¼	56	87	57½	84	55½	78	1.40	1.75
1906.										
y	65	67	68	70½	65	68	60	60	...	...
ry	63	65	65	70	63	65	60	61	...	...
	58½	63	66	70	58½	63	56	59	...	...
	58	62½	66	70	58	62½	56	57	...	...
	58	62	66	69	58	62	57	57	...	...
	60	61½	62	69	60	62	57	57	...	...
	56	60	58	64	56	60	53	57	...	...
	55½	56½	58	62	55½	56½	53	53	...	...
ber	55½	62	60	66	55½	63	53	56	...	...
r	62	62½	65	68½	60	62½	56	59½	...	...
ber	60	65	66½	72	60	65	58	61	...	...
ber	61	65	69	72½	61	65	60	61	...	...
ear	55½	67	58	72½	55½	68	53	61		...
1907.										
y	75	77	68	71	60	63	57	60	1.42½	1.47½
ry	75	80	69	73	64	70	60	60	1.35	1.42½
	75	80	71	74	64	70	60	60½	1.35	1.45
	77	82	73	75	67	72	60	61	1.40	1.50
	79	89	73	84	69	87½	64	78	1.40	1.50
	93	98	81	88	84	88¼	80	82½	1.40	1.50
	93	98	80	88	83	88	74	80	1.45	1.50
	75	96	79	88	69	86	66	71	1.42½	1.50
ber	90	95	84	91	85	91¼	75	85	1.40	1.47½
r	80	100	81	93	72	90	75	86	1.37½	1.45
ber	85	95	79	84	75	86	67	76	1.40	1.45
ber	85	95	78	84	75	82	70	76	1.40	1.52½
ear	75	100	68	93	60	91¼	57	86	1.35	1.52½
1908.										
y	93	95	81	89	79	87	71	78	1.45	1.52½
ry	93	95	85	89	80	85	74	78	1.47½	1.52½
	94	95	85	89	74	85	69	80	1.47½	1.52½
	94	95	82	84	74	81	69	74	1.43¾	1.50
	92	94	82	86	79	86	71	76	1.43¾	1.50
	90	92	84	86	72	80	66	76	1.45	1.52½
	90	92	78	86	72	80	60	73	1.45	1.50
	80	85	78	81	75	78½	71½	75	1.35	1.45
ber	80	85	78	80	75½	77	71	74	1.40	1.45
r	81	86	78	82	74	76½	68½	74	1.40	1.47½
ber	82	86	78	80	73	76	67	71	1.45	1.50
ber	82	86	78	80	75	77½	67	72	1.42½	1.50
ear	80	95	78	89	72	87	60	80	1.35	1.52½
1909.										
y	90	95	78	82	74	77½	67	71	1.55	1.70
ry	90	95	80	82	75½	79½	67	74	1.65	1.85
	88	95	81	84	79	81	71	75	1.75	1.85
	87	88	82	90	80	87	72	83	......	......
	85	87	88	92	83	90	80	88	......	......
	85	87	90	92	81	91	72	88	......	......
	75	80	75	90	74	83½	69	76	......	......
	75	82	70	85	67	76½	62	72	1.70	1.80
ber	82	85	70	77½	70	74	62	67	1.80	1.85
r	85	86	75	78	71	75	64	71	......	......

RYE—Continued.

Average farm price of rye per bushel, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	73.4	73.3	79.2	77.6	92.5	88.1	70.8	72.1	63.2	64.7	88.3	89.3	86.4	76.0
February	73.8	.....	79.8	.....	92.3	.....	70.5	.....	63.8	.....	88.0	.....	93.5	.....
March	75.0	74.5	79.5	78.8	95.7	91.2	72.7	73.4	66.1	66.1	89.2	89.4	89.1	76.7
April	77.3	75.3	82.5	79.0	95.4	90.9	74.3	75.0	68.5	66.0	92.6	87.7	92.9	79.2
May	78.8	74.7	83.1	80.2	98.3	90.1	76.2	73.2	71.1	65.6	94.0	89.3	91.4	74.5
June	81.2	76.3	85.8	80.7	95.8	92.2	78.8	75.4	74.1	67.2	91.9	90.1	91.0	74.7
July	81.7	75.4	88.0	80.5	98.5	94.0	78.9	73.9	72.3	65.5	92.6	85.4	92.0	76.1
August	78.5	74.2	86.5	80.7	95.2	92.8	75.5	70.8	67.7	65.7	89.1	80.5	85.8	79.0
September	72.4	72.8	80.4	78.6	94.5	96.8	68.1	69.1	61.9	64.7	92.9	83.9	86.0	76.0
October	72.8	74.1	81.0	79.5	96.7	96.6	68.7	71.1	61.9	65.8	97.6	89.1	81.0	75.6
November	73.6	73.7	80.1	78.5	95.9	95.0	70.7	71.3	62.4	64.0	98.2	92.6	84.7	78.9
December	73.9	73.6	80.3	78.9	97.0	90.9	70.0	71.7	62.4	63.5	98.6	90.2	95.9	84.5

Average yield of rye in countries named, bushels per acre, 1889–1908.

Year.	United States.[a]	Russia, European.[b]	Germany.[b]	Austria.[b]	Hungary proper.[b]	France.[a]	Ireland.[b]
Average (1889-1898)	13.7	10.0	20.0	15.7	......	17.4	25.2
1899	14.4	12.8	23.5	18.7	17.7	18.2	25.8
1900	15.1	12.7	22.9	13.0	15.1	16.9	25.7
1901	15.3	10.3	22.4	16.9	15.8	16.7	27.3
1902	17.0	12.5	24.6	18.2	19.1	14.3	28.1
1903	15.4	12.2	26.2	18.2	18.2	15.1	26.9
1904	15.2	13.7	26.3	19.3	17.1	16.6	26.0
1905	16.5	10.1	24.9	20.2	19.4	18.5	27.0
1906	16.7	8.8	25.1	19.9	19.8	16.3	27.6
1907	16.4	10.8	25.7	18.8	16.2	18.2	27.0
1908	16.4	11.0	24.7	20.4	17.5	16.6	29.2
Average (1899-1908)	15.8	11.5	25.0	18.6	17.7	17.1	27.0

[a] Winchester bushels. [b] Bushels of 56 pounds. [c] Average, 1898–1907.

BUCKWHEAT.

Acreage, production, and value of buckwheat in the United States, 1849–1909.

Year.	Acreage sown and harvested.	Average yield per acre.	Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dollars.*
1849 *a*			8,957,000		
1859 *a*			17,572,000		
1866	1,046,000	21.8	22,792,000	67.6	15,413,000
1867	1,228,000	17.4	21,359,000	78.7	16,812,000
1868	1,114,000	17.8	19,864,000	78.0	15,490,000
1869	1,029,000	16.9	17,431,000	71.9	12,535,000
1870	537,000	18.3	9,842,000	70.5	6,937,000
1871	414,000	20.1	8,329,000	74.5	6,208,000
1872	448,000	18.1	8,134,000	73.5	5,979,000
1873	454,000	17.3	7,838,000	75.0	5,879,000
1874	453,000	17.7	8,017,000	72.9	5,844,000
1875	576,000	17.5	10,082,000	62.0	6,255,000
1876	666,000	14.5	9,669,000	66.6	6,436,000
1877	650,000	15.7	18,177,000	66.9	6,808,000
1878	673,000	18.2	12,247,000	52.6	6,411,000
1879	640,000	20.5	13,140,000	59.8	7,856,000
1880	823,000	17.8	14,618,000	59.4	8,682,000
1881	829,000	11.4	9,486,000	86.5	8,206,000
1882	847,000	13.0	11,019,000	73.0	8,039,000
1883	857,000	8.9	7,669,000	82.2	6,304,000
1884	879,000	12.6	11,116,000	58.9	6,549,000
1885	914,000	13.8	12,626,000	55.9	7,057,000
1886	918,000	12.9	11,869,000	54.5	6,465,000
1887	911,000	11.9	10,844,000	56.5	6,122,000
1888	913,000	13.2	12,050,000	63.3	7,628,000
1889	837,000	14.5	12,110,000	50.5	6,113,000
1890	845,000	14.7	12,433,000	57.4	7,133,000
1891	849,000	15.0	12,761,000	57.0	7,272,000
1892	861,000	14.1	12,143,000	51.8	6,296,000
1893	816,000	14.9	12,132,000	58.3	7,074,000
1894	789,000	16.1	12,668,000	56.6	7,040,000
1895	763,000	20.1	15,341,000	45.2	6,936,000
1896	55,000	18.7	14,090,000	39.2	5,522,000
1897	718,000	20.9	14,997,000	42.1	6,319,000
1898	678,000	17.3	11,722,000	45.0	5,271,000
1899	670,000	16.6	11,094,000	55.7	6,184,000
1900	638,000	15.0	9,567,000	55.8	5,341,000
1901	811,000	18.6	15,126,000	56.3	8,523,000
1902	805,000	18.1	14,530,000	59.6	8,655,000
1903	804,000	17.7	14,244,000	60.7	8,651,000
1904	794,000	18.9	15,008,000	62.2	9,331,000
1905	760,000	19.2	14,585,000	58.7	8,565,000
1906	789,000	18.6	14,642,000	59.6	8,727,000
1907	800,000	17.9	14,290,000	69.8	9,975,000
1908	803,000	19.8	15,874,000	75.6	12,004,000
1909	834,000	20.9	17,438,000	69.9	12,188,000

a Census figures.

BUCKWHEAT—Continued.

Acreage, production, and value of buckwheat in the United States in 1909.

State, Territory, or Division.	Acreage sown and harvested.	Production.	Farm value December 1.
Maine	23,000	644,000	$451,000
New Hampshire	2,000	44,000	33,000
Vermont	8,000	176,000	134,000
Massachusetts	3,000	58,000	44,000
Connecticut	3,000	58,000	58,000
New York	313,000	7,512,000	5,183,000
New Jersey	13,000	283,000	209,000
Pennsylvania	290,000	5,655,000	3,845,000
N. Atlantic	655,000	14,430,000	9,957,000
Delaware	2,000	40,000	24,000
Maryland	9,000	149,000	110,000
Virginia	21,000	378,000	287,000
West Virginia	22,000	499,000	379,000
North Carolina	5,000	99,000	79,000
S. Atlantic	59,000	1,165,000	879,000
Ohio	15,000	318,000	248,000
Indiana	*6,000*	*104,000*	*82,000*
Illinois	4,000	73,000	58,000

State, Territory, or Division.	Acreage.	Production.	Farm value December 1.
Michigan	58,000	829,000	$547,000
Wisconsin	18,000	221,000	172,000
N. C. E. of Miss. R.	101,000	1,545,000	1,107,000
Minnesota	5,000	76,000	54,000
Iowa	9,000	135,000	115,000
Missouri	2,000	42,000	37,000
Nebraska	1,000	16,000	14,000
Kansas	1,000	14,000	14,000
N. C. W. of Miss. R.	18,000	283,000	234,000
Tennessee	1,000	15,000	11,000
S. Central	1,000	15,000	11,000
United States	*834,000*	*17,438,000*	*12,188,000*

Condition of the buckwheat crop in the United States on first of months named, 1889–1909.

Year.	Aug.	Sept.	When harvested.	Year.	Aug.	Sept.	When harvested.	Year.	Aug.	Sept.	When harvested.
	P. ct.	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*
1889	95.2	92.1	90.0	1896	96.0	93.2	86.0	1903	93.9	91.0	83.0
1890	90.1	90.5	90.7	1897	94.9	95.1	90.8	1904	92.8	91.5	88.7
1891	97.3	96.6	92.7	1898	87.2	88.8	76.2	1905	92.6	91.8	91.6
1892	92.9	89.0	85.6	1899	93.2	75.2	70.2	1906	93.2	91.2	84.9
1893	88.8	77.5	73.5	1900	87.9	80.5	72.8	1907	91.9	77.4	80.1
1894	82.3	69.2	72.0	1901	91.1	90.9	90.5	1908	89.4	87.8	81.6
1895	85.2	87.5	84.8	1902	91.4	86.4	80.5	1909	86.4	81.1	79.5

Average farm price of buckwheat per bushel, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	74.3	71.7	73.7	71.6	77.5	74.4	77.1	69.9	75.3	77.7	65.0	85.0	......	......
February	74.2	......	73.8	......	76.6	......	75.7	......	77.0	......	80.0	......	......	......
March	75.5	72.4	74.8	72.6	77.7	73.4	78.5	68.8	80.9	83.4	80.0	65.0	......	......
April	76.2	76.6	75.1	77.1	80.8	78.0	80.2	70.8	88.2	81.3	84.0	90.0	......	......
May	78.8	77.0	77.6	77.4	86.0	80.9	80.7	70.8	96.9	77.0	89.0	90.0	......	......
June	83.4	75.8	83.1	75.4	85.4	81.7	83.5	73.6	90.7	84.3	75.0	90.0	......	......
July	86.9	86.0	86.8	86.8	87.5	85.1	86.7	80.0	92.2	93.5	85.0	90.0	......	......
August	82.9	80.1	82.9	80.5	83.2	83.5	81.5	72.9	93.2	93.2	90.0	86.0	......	......
September	76.9	80.0	76.3	81.4	80.4	79.9	77.9	71.0	84.0	80.6	77.0	90.0	......	......
October	74.8	77.2	74.0	78.0	80.4	77.8	75.2	70.8	88.9	82.4	74.0	85.0	......	......
November	71.6	77.1	70.6	77.7	78.5	74.1	74.0	75.0	81.9	76.5	73.0	87.0	......	......
December	69.9	75.6	69.0	75.5	75.5	76.5	71.7	75.5	82.7	77.8	79.0	80.0	......	......

BUCKWHEAT—Continued.

Average yield per acre of buckwheat in the United States.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	23.1	21.6	23.4	31.0	30.0	31.7	30.1	29.8	32.5	30.0	28.0	28.0	30.0	28.0
New Hampshire	19.8	19.1	19.9	22.5	22.0	21.0	20.0	19.6	25.1	23.0	22.0	22.0	21.5	22.0
Vermont	21.3	20.7	21.8	24.4	25.0	25.1	25.0	24.0	26.3	19.0	21.0	22.0	22.0	22.0
Massachusetts	14.8	13.5	16.3	17.8	17.0	18.9	14.4	13.7	16.2	20.0	20.0	21.0	18.0	19.3
Connecticut	17.1	12.9	13.8	17.1	16.0	18.0	18.4	17.5	16.3	16.0	17.0	16.0	18.2	19.5
New York	20.0	14.8	15.8	17.7	14.0	18.8	17.7	18.3	18.8	19.0	19.0	17.5	21.4	24.0
New Jersey	17.2	14.3	13.4	19.6	16.0	19.0	22.5	18.1	20.8	21.0	18.0	16.5	20.0	21.8
Pennsylvania	19.0	14.6	14.7	18.2	14.0	19.5	18.1	16.5	18.8	20.0	19.0	18.0	19.2	19.5
North Atlantic	19.7	15.1	15.8	18.6	15.1	19.7	18.6	18.1	19.5	19.8	19.3	18.1	20.8	22.0
Delaware	19.5	..	14.6	16.4	13.0	17.8	15.2	15.2	12.1	17.0	17.0	24.0	30.0	10.8
Maryland	17.5	15.3	12.9	17.0	15.0	17.5	17.0	16.3	18.2	19.0	18.0	19.0	18.5	16.6
Virginia	15.1	13.2	10.4	16.2	13.0	15.9	16.6	18.6	17.0	18.0	19.0	19.0	18.0	18.0
West Virginia	16.7	13.8	12.9	19.1	17.0	20.6	22.5	17.2	19.1	19.0	18.0	18.5	18.0	22.7
North Carolina	17.2	10.2	10.6	15.2	13.0	15.6	14.5	12.1	14.7	15.0	14.0	15.5	16.4	10.8
South Atlantic	16.7	13.5	12.3	17.2	15.5	18.0	18.7	17.0	17.6	18.2	17.9	18.6	18.1	19.7
Ohio	14.4	12.5	12.7	16.9	16.0	16.1	13.9	16.6	16.9	17.0	19.0	19.5	18.5	21.2
Indiana	16.0	12.9	11.6	16.7	14.0	13.1	17.6	16.8	16.1	17.0	16.0	15.5	17.0	17.3
Illinois	14.8	12.3	12.1	14.6	15.0	11.0	15.5	15.3	17.9	16.0	19.0	17.0	18.2	18.2
Michigan	17.1	14.6	13.6	14.6	14.0	14.1	13.0	15.5	15.4	16.0	13.0	15.5	13.5	11.3
Wisconsin	16.3	12.8	12.0	15.3	14.0	12.4	16.0	15.6	17.7	15.0	15.0	16.0	15.2	12.3
N. Central E. of Miss. River	16.1	13.2	12.7	15.2	14.3	13.5	14.5	15.7	16.5	15.9	14.7	16.2	15.0	15.3
Minnesota	16.9	12.8	12.3	14.7	15.0	14.5	13.9	15.2	15.1	14.0	14.0	14.7	18.2	15.2
Iowa	18.2	12.9	12.1	15.3	15.0	13.5	16.0	15.1	14.8	13.0	12.0	15.0	15.5	15.0
Missouri	18.8	14.3	10.9	14.6	13.0	6.0	16.0	14.8	13.5	16.0	18.0	16.0	20.1	21.0
Nebraska	19.9	13.1	9.4	15.4	16.0	11.5	14.7	19.0	14.7	14.0	15.0	14.5	18.0	16.0
Kansas	18.3	13.3	10.4	12.7	16.0	7.9	12.0	18.1	14.0	11.0	17.0	12.0	18.7	14.0
N. Central W. of Miss. River	18.0	13.2	11.4	14.8	15.0	12.2	14.6	15.4	14.6	13.5	13.6	14.8	16.9	15.7
Tennessee	12.3	11.9	9.7	16.4	14.0	14.2	18.0	14.7	15.5	16.0	16.0	15.0	15.3	15.0
South Central	12.4	11.7	10.0	16.0	14.0	14.2	18.0	14.7	15.5	16.0	16.0	15.0	15.3	15.0
Oregon	22.3	14.7	16.8	16.6	13.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
Far Western	23.1	20.0	19.0	17.6	13.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States	18.3	14.6	14.7	18.1	15.0	18.6	18.1	17.7	18.9	19.2	18.6	17.9	19.8	20.9

BUCKWHEAT—Continued.

Average farm value per acre of buckwheat in the United States December 1.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	15.48	12.10	12.87	14.88	14.70	15.22	15.81	15.20	16.90	19.50	16.52	18.22	22.52	19.61
N. Hampshire	13.07	12.03	11.34	13.05	11.44	11.55	13.00	11.50	17.07	16.33	16.06	16.50	17.00	16.50
Vermont	14.06	12.42	11.34	12.44	12.50	14.81	14.00	13.20	14.73	9.69	12.18	15.38	15.38	16.75
Massachusetts	11.54	9.45	11.08	11.93	12.24	11.53	10.66	9.32	11.66	14.20	13.00	15.00	14.50	14.67
Connecticut	14.71	9.68	8.83	10.94	10.40	11.70	13.06	12.42	11.90	11.68	12.75	12.00	14.67	19.33
New York	14.00	9.62	8.53	9.38	7.98	10.72	10.44	10.80	11.47	11.21	11.59	12.25	16.27	16.56
New Jersey	14.79	10.44	8.17	11.17	9.44	9.88	14.40	11.58	13.73	13.23	10.80	12.42	15.00	16.08
Pennsylvania	14.44	9.93	8.00	9.65	7.70	10.92	11.04	10.56	11.84	11.20	10.83	12.42	14.40	13.26
N. Atlantic	14.28	9.98	8.63	9.86	8.34	11.03	11.05	10.93	11.93	11.57	11.48	12.56	15.70	15.20
Delaware	15.99	9.25	8.32	8.20	6.76	9.79	9.12	8.36	7.50	9.69	10.37	17.00	22.00	12.00
Maryland	13.82	10.40	7.87	9.86	8.55	10.50	10.37	10.27	11.47	11.97	10.80	12.78	14.00	12.22
Virginia	9.82	8.45	6.14	8.91	7.15	8.90	9.96	11.35	10.88	11.16	11.02	13.89	12.95	13.67
W. Virginia	12.52	9.11	8.13	11.27	9.52	12.15	13.95	11.70	13.75	12.54	11.70	13.86	14.57	17.23
N. Carolina	10.66	6.73	5.83	8.97	7.28	9.67	8.99	7.86	10.44	9.90	8.96	11.00	12.80	15.50
S. Atlantic	12.21	8.91	7.52	9.82	8.70	10.50	11.44	10.90	11.92	11.64	11.02	13.48	13.85	14.90
Ohio	11.52	9.38	8.00	9.80	9.28	9.66	8.48	10.79	12.17	10.54	10.83	14.69	15.15	16.53
Indiana	11.36	9.68	7.08	10.02	8.54	7.99	10.21	11.76	11.27	11.05	10.24	11.25	13.29	13.67
Illinois	*10.80*	*9.22*	*7.26*	*9.34*	*9.75*	*7.70*	*11.01*	*11.17*	*13.96*	*10.88*	*14.25*	*13.50*	*16.40*	*14.50*
Michigan	11.29	9.49	7.21	7.30	7.14	7.19	6.89	8.37	9.39	8.48	7.15	10.07	9.58	9.43
Wisconsin	10.11	8.19	6.36	8.26	8.26	7.32	9.44	9.52	11.15	8.40	9.30	11.50	11.55	9.56
N. C. E. of Miss. R.	10.93	9.12	6.91	8.16	8.15	7.57	8.37	9.39	10.65	8.99	8.56	11.19	11.32	10.96
Minnesota	12.17	8.19	6.64	7.79	8.55	8.99	7.92	8.06	9.06	7.98	7.56	10.80	13.20	10.80
Iowa	12.74	9.03	7.50	9.33	9.60	9.45	11.20	10.72	9.92	9.10	9.12	12.00	12.11	12.78
Missouri	12.60	9.58	6.98	10.22	8.97	4.56	9.34	11.10	11.48	13.12	13.32	14.00	17.00	18.50
Nebraska	17.51	9.82	5.64	9.55	10.24	6.67	7.79	13.11	13.38	8.82	9.30	12.00	15.00	14.00
Kansas	15.92	10.51	7.38	9.52	11.20	5.92	9.00	14.35	11.20	7.59	12.58	10.00	17.00	14.00
N. C. W. of Miss. R.	13.01	9.23	6.82	8.85	9.29	8.18	9.38	10.33	10.12	9.09	9.35	11.71	13.15	13.00
Tennessee	10.09	8.45	5.63	10.33	8.26	8.38	13.68	9.70	11.01	10.88	13.28	12.00	12.00	11.00
S. Central	10.25	8.17	5.45	10.67	8.26	8.38	13.68	9.70	11.01	10.88	13.28	12.00	12.24	11.00
Oregon	24.75	11.61	10.92	10.96	10.01	......	......	......	......	......	......	......	......	......
Far Western	25.87	15.34	11.68	9.38	10.01	......	......	......	......	......	......	......	......	......
United States	13.27	9.67	8.08	9.68	8.37	10.51	10.75	10.75	11.76	11.27	11.06	12.47	14.95	14.61

BUCKWHEAT—Continued.

Average farm price of buckwheat per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900	1901	1902	1903	1904	1905	1906	1907	1908	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
Maine	67	56	55	48	49	48	52	51	52	65	59	65	75	72	69	81	74	66	70
New Hampshire	66	63	57	58	52	55	65	59	68	71	73	75	80	80	81	80	80	80	76
Vermont	66	60	52	51	50	59	56	55	56	51	58	70	70	72	76	100	92	86	76
Massachusetts	78	70	68	67	72	61	74	68	72	71	68	70	80	90	101	100	88	....	75
Connecticut	80	75	64	64	65	65	71	71	73	73	75	75	80	90	90	100	97	100	100
New York	70	65	54	53	57	57	59	59	61	59	60	70	76	75	76	86	83	75	69
New Jersey	86	73	61	57	59	52	64	64	66	63	60	75	75	75	78	96	92	85	74
Pennsylvania	76	68	55	53	55	56	61	64	63	56	57	69	75	72	74	78	83	73	68
North Atlantic	72.5	66.1	54.6	53.0	55.4	56.0	59.5	60.4	61.3	58.3	59.4	69.4	76.5	73.8	75.1	83.1	82.9	74.0	69.0
Delaware	82	69	57	50	52	55	60	55	62	57	61	69	72	77	81	85		65	60
Maryland	79	68	61	58	57	60	61	63	63	63	60	67	76	75	79	85	88	82	74
Virginia	65	64	59	55	55	56	60	61	64	62	58	73	72	73	77	85	85	79	76
West Virginia	75	66	63	59	56	59	62	68	72	66	65	75	81	79	83	85	80	84	76
North Carolina	62	66	55	59	56	62	62	65	71	66	64	71	78	85	91	90	80	89	80
South Atlantic	73.1	66.0	61.1	57.1	56.1	58.4	61.2	64.1	67.7	64.0	61.6	72.5	76.5	76.6	80.8	85.4	83.2	80.4	75.5
Ohio	80	75	63	58	58	60	61	65	72	62	57	75	82	77	93	90	85	77	78
Indiana	71	75	61	60	61	61	58	70	70	65	64	73	78	85	84	95	95	89	77
Illinois	73	75	60	64	65	70	71	73	78	68	75	80	90	100	103	100	95	98	80
Michigan	66	65	53	50	51	51	53	54	61	53	55	65	71	71	74	77	75	68	66
Wisconsin	62	64	53	54	59	59	59	61	63	56	62	72	76	75	77	86	85	79	78
N. C. E. of Miss. River	67.9	69.1	54.4	53.7	56.9	55.9	57.6	59.7	64.7	56.7	58.4	69.1	75.5	75.7	80.2	83.5	81.5	75.2	71.7
Minnesota	72	64	54	53	57	62	57	53	60	57	54	73	73	69	74	80	80	66	71
Iowa	70	70	62	61	64	70	70	71	67	70	76	80	78	80	93	95	100	101	85
Missouri	67	67	64	70	69	76	58	75	85	82	74	90	85	90	96	101	105	....	90
Nebraska	88	75	60	62	64	58	53	69	91	63	62	88	83	75	93	98	....	77	90
Kansas	87	79	71	75	70	75	75	78	80	69	74	82	91		110	....	....	88	100
N. C. W. of Miss. River	72.3	69.9	59.8	59.8	61.9	66.8	64.2	66.9	69.4	67.4	68.8	79.1	77.8	77.0	88.2	90.7	93.2	88.9	82.7
Tennessee	82	71	58	63	59	59	76	66	71	68	83	80	80	80	84	75	90	74	79
South Central	82.7	69.8	54.5	66.7	59.0	59.0	76.0	66.0	71.0	68.0	83.0	80.0	80.0	80.0	84.0	75.0	90.0	74.0	79.0
Oregon	111	79	65	66	77	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Far Western	*112.0*	*76.7*	*61.5*	*53.3*	*77.0*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
United States	72.5	66.2	55.0	53.5	55.8	56.3	59.6	60.7	62.2	58.7	59.6	69.8	75.6	74.2	76.2	83.4	82.9	74.8	69.9

POTATOES.

Potato crop of countries named, 1904–1908.

[No statistics for Switzerland, Portugal, Argentina, Transvaal, Egypt, and some other less important potato-growing countries.]

Countries.	1904.	1905.	1906.	1907.	1908.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
United States	332,830,000	260,741,000	308,038,000	298,262,000	278,985,000
Canada:					
Ontario	15,967,000	14,819,000	15,194,000	20,908,000	23,096,000
Manitoba	3,919,000	2,901,000	4,281,000	4,150,000	3,807,000
New Brunswick	5,550,000	5,693,000	5,522,000	5,183,000	11,203,000
Saskatchewan and Alberta	[a] 1,000,000	2,844,000	5,507,000	5,338,000	3,793,000
Other	[a] 29,000,000	[a] 29,000,000	[a] 29,000,000	36,657,000	32,847,000
Total Canada	55,436,000	55,257,000	59,804,000	72,236,000	74,746,000
Mexico	527,000	469,000	[b] 469,000	[b] 469,000	[b] 469,000
Newfoundland [a]	1,350,000	1,350,000	1,350,000	1,350,000	1,350,000
Total	390,143,000	317,817,000	369,661,000	372,317,000	355,550,000
SOUTH AMERICA.					
Chile	6,131,000	6,532,000	[b] 6,532,000	[b] 6,532,000	8,063,000
EUROPE.					
Austria-Hungary:					
Austria	398,298,000	581,822,000	514,289,000	538,789,000	475,860,000
Hungary proper	110,402,000	168,225,000	179,083,000	178,168,000	139,469,000
Croatia-Slavonia	9,311,000	12,589,000	12,854,000	25,625,000	21,129,000
Bosnia-Herzegovina	2,450,000	2,485,000	2,328,000	2,949,000	[c] 2,949,000
Total Austria-Hungary	520,461,000	765,121,000	708,554,000	745,531,000	639,407,000
Belgium	91,632,000	57,159,000	88,652,000	88,192,000	82,846,000
Denmark	24,214,000	29,954,000	28,454,000	24,005,000	29,752,000
Finland	15,465,000	20,704,000	20,432,000	[d] 20,432,000	[d] 20,432,000
France	451,039,000	523,876,000	372,076,000	404,181,000	375,000,000
Germany	1,333,326,000	1,775,579,000	1,577,653,000	1,673,246,000	1,702,803,000
Italy [e]	29,000,000	29,000,000	29,000,000	29,000,000	29,000,000
Malta	733,000	387,000	378,000	793,000	692,000
Netherlands	94,421,000	87,043,000	95,503,000	94,401,000	96,695,000
Norway	17,253,000	25,832,000	20,995,000	16,956,000	28,030,000
Roumania	3,001,000	3,733,000	4,636,000	3,860,000	4,310,000
Russia:					
Russia proper	705,170,000	686,502,000	630,211,000	694,487,000	682,454,000
Poland	179,997,000	331,529,000	296,662,000	327,689,000	368,433,000
Northern Caucasia	8,741,000	14,857,000	12,844,000	11,932,000	11,248,000
Total Russia (European)	893,908,000	1,032,888,000	939,717,000	1,034,108,000	1,060,135,000
Servia	718,000	1,232,000	1,799,000	876,000	645,000
Spain [e]	84,000,000	84,000,000	84,000,000	84,000,000	84,000,000
Sweden	51,314,000	74,819,000	63,829,000	57,823,000	78,020,000
United Kingdom:					
Great Britain	133,961,000	140,474,000	128,005,000	111,159,000	146,258,000
Ireland	98,635,000	127,793,000	99,328,000	83,869,000	119,455,000
Total Great Britain and Ireland	232,596,000	268,267,000	227,333,000	195,028,000	265,713,000
Total	3,843,081,000	4,779,594,000	4,263,011,000	4,472,432,000	4,497,480,000
ASIA.					
Japan	11,274,000	16,255,000	18,691,000	21,023,000	[c] 21,023,000
Russia (Asiatic)	18,800,000	18,865,000	16,481,000	17,076,000	22,588,000
Total	30,074,000	35,120,000	35,172,000	38,099,000	43,611,000
AFRICA.					
Algeria	1,655,000	1,605,000	1,684,000	1,803,000	[c] 1,803,000
Cape of Good Hope	1,942,000	[f] 1,500,000	[f] 1,500,000	[f] 1,500,000	1,304,000
Natal	451,000	466,000	454,000	444,000	405,000
Total	4,048,000	3,571,000	3,638,000	3,747,000	3,512,000

[a] Estimated from returns for census year.
[b] Data for 1905.
[c] Data for 1907.
[d] Data for 1906.
[e] Average production.
[f] Estimated.

POTATOES—Continued.

Potato crop of countries named, 1904–1908—Continued.

Countries.	1904.	1905	1906.	1907.	1908
AUSTRALASIA.					
Australia:	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels*	*Bushels.*
Queensland	659,000	718,000	422,000	591,000	402,000
New South Wales	2,118,000	1,820,000	1,881,000	4,288,000	2,080,000
Victoria	6,262,000	3,467,000	4,307,000	6,220,000	5,044,000
South Australia	1,173,000	729,000	756,000	832,000	756,000
Western Australia	170,000	210,000	235,000	188,000	212,000
Tasmania	6,395,000	4,127,000	2,412,000	6,807,000	5,431,000
Total Australia	16,777,000	11,071,000	10,013,000	18,935,000	14,021,000
New Zealand	7,795,000	5,025,000	4,607,000	6,342,000	[illegible]
Total Australasia	24,572,000	16,096,000	14,620,000	[illegible]	[illegible]
Grand total	4,298,049,000	5,158,730,000	[illegible]	4,918,404,000	1,927,571,000

Acreage, production, and value of potatoes in the United States in 1909.

State, Territory, or Division.	Acreage.	Production.	Farm value December 1.	State, Territory, or Division.	Acreage.	Production.	Farm value December 1.
	Acres.	*Bushels*	*Dollars*		*Acres*	*Bushels.*	*Dollars*
Maine	130,000	29,250,000	13,748,000	Missouri	88,000	7,480,000	5,012,000
N. Hampshire.	21,000	2,730,000	1,747,000	North Dakota.	40,000	4,400,000	1,980,000
Vermont	30,000	4,050,000	2,046,000	South Dakota	50,000	4,000,000	2,520,000
Massachusetts	34,000	4,250,000	3,358,000	Nebraska	105,000	8,190,000	4,914,000
Rhode Island	6,000	750,000	600,000	Kansas	91,000	7,189,000	5,679,000
Connecticut	36,000	4,320,000	3,586,000	N. C. W. of Miss. River.	679,000	62,564,000	33,643,000
New York	438,000	52,560,000	26,280,000				
New Jersey	80,000	7,200,000	5,904,000				
Pennsylvania.	305,000	23,790,000	15,464,000	Kentucky	40,000	3,680,000	2,355,000
N. Atlantic	1,080,000	129,500,000	72,733,000	Tennessee	30,000	2,250,000	1,598,000
				Alabama	17,000	1,360,000	1,333,000
Delaware	9,000	864,000	622,000	Mississippi	9,000	783,000	744,000
Maryland	35,000	2,800,000	1,848,000	Louisiana	16,000	1,200,000	1,092,000
Virginia	60,000	5,520,000	3,864,000	Texas	60,000	3,000,000	3,180,000
West Virginia	39,000	3,822,000	2,599,000	Oklahoma	27,000	1,800,000	1,796,000
North Carolina.	25,000	1,850,000	1,498,000	Arkansas	33,000	2,310,000	2,125,000
South Carolina.	9,000	765,000	880,000	S. Central	232,000	16,473,000	14,223,000
Georgia	10,000	810,000	810,000				
Florida	5,000	475,000	570,000	Montana	25,000	4,500,000	2,295,000
S. Atlantic	192,000	16,906,000	12,691,000	Wyoming	10,000	1,600,000	1,008,000
				Colorado	65,000	10,400,000	5,928,000
Ohio	182,000	16,926,000	9,479,000	New Mexico	1,000	85,000	86,000
Indiana	95,000	9,025,000	4,693,000	Utah	15,000	2,700,000	1,161,000
Illinois	164,000	14,924,000	9,104,000	Nevada	3,000	540,000	459,000
Michigan	348,000	36,540,000	12,789,000	Idaho	25,000	5,000,000	2,400,000
Wisconsin	262,000	26,724,000	10,155,000	Washington	41,000	6,970,000	3,276,000
N. C. E. of Miss. River.	1,051,000	104,139,000	46,220,000	Oregon	46,000	7,360,000	4,416,000
				California	60,000	7,800,000	6,000,000
Minnesota	160,000	18,400,000	6,440,000	Far Western.	291,000	46,955,000	27,035,000
Iowa	145,000	12,905,000	7,098,000	United States	3,525,000	376,537,000	206,545,000

Condition of the potato crop in the United States on the first of months named, 1889–1909.

Year.	July.	Aug.	Sept.	Oct.	Year.	July.	Aug.	Sept.	Oct.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct*	*P. ct.*	*P. ct.*
1889	95.1	94.3	81.7	77.9	1900	91.3	88.2	80.0	74.4
1890	91.7	77.4	65.7	61.7	1901	87.4	62.3	52.2	54.0
1891	95.3	96.5	94.8	91.3	1902	92.9	94.8	89.1	82.5
1892	90.0	86.8	74.8	67.7	1903	88.1	87.2	84.3	74.6
1893	94.8	86.0	71.8	71.2	1904	93.9	94.1	91.6	89.5
1894	92.3	74.0	62.4	64.3	1905	91.2	87.2	80.9	74.3
1895	91.5	89.7	90.8	87.4	1906	91.5	89.0	85.3	82.2
1896	99.0	94.8	83.2	81.7	1907	90.2	88.5	80.2	77.0
1897	87.8	77.9	66.7	61.6	1908	89.6	82.9	73.7	68.7
1898	95.5	83.9	77.7	72.5	1909	93.0	85.8	80.9	78.8
1899	93.8	93.0	86.3	81.7					

POTATOES—Continued.

Acreage, production, value, prices, exports, etc., of potatoes in the United States, 1849–1909.

Year.	Acreage planted and harvested.	Average yield per acre.	Production.	Average farm price per bushel Dec. 1.	Farm value Dec. 1.	Chicago price per bushel, Burbank. December. Low.	Chicago price per bushel, Burbank. December. High.	Chicago price per bushel, Burbank. May of following year. Low.	Chicago price per bushel, Burbank. May of following year. High.	Domestic exports, fiscal year beginning July 1.	Imports during fiscal year beginning July 1.
	Acres.	*Bush.*	*Bushels.*	*Cts.*	*Dollars.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Bushels.*	*Bushels.*
1849[a]			65,798,000							155,595	
1850[a]			111,149,000							380,372	
1866	1,069,000	100.2	107,201,000	47.3	50,723,000					512,380	198,265
1867	1,192,000	82.0	97,783,000	65.9	64,462,000					378,605	209,555
1868	1,132,000	93.8	106,090,000	59.3	62,919,000					568,249	138,470
1869	1,222,000	109.5	133,886,000	42.9	57,481,000					596,968	75,336
1870	1,325,000	86.6	114,775,000	65.0	74,621,000					553,070	458,758
1871	1,221,000	98.7	120,462,000	53.9	64,905,000					621,537	96,259
1872	1,331,000	85.3	113,516,000	53.5	60,692,000					515,306	346,840
1873	1,295,000	81.9	106,089,000	65.2	69,154,000					497,413	549,073
1874	1,310,000	80.9	105,981,000	61.5	65,223,000					609,642	188,757
1875	1,510,000	110.5	166,877,000	34.4	57,358,000					704,379	92,148
1876	1,742,000	71.7	124,827,000	61.9	77,320,000					529,650	3,205,555
1877	1,792,000	94.9	170,092,000	43.7	74,272,000					744,409	528,584
1878	1,777,000	69.9	124,127,000	58.7	72,924,000					625,342	2,624,149
1879	1,837,000	98.9	181,626,000	43.6	79,154,000					696,080	721,868
1880	1,843,000	91.0	167,660,000	48.3	81,062,000					638,840	2,170,372
1881	2,042,000	53.5	109,145,000	91.0	99,291,000					408,286	8,789,860
1882	2,172,000	78.7	170,973,000	55.7	95,305,000					439,443	2,362,362
1883	2,289,000	90.9	208,164,000	42.2	87,849,000					554,613	425,408
1884	2,221,000	85.8	190,642,000	39.6	75,524,000					380,868	658,633
1885	2,266,000	77.2	175,029,000	44.7	78,153,000			33	50	494,948	1,937,416
1886	2,287,000	73.5	168,051,000	46.7	78,442,000	44	47	65	90	434,864	1,432,490
1887	2,357,000	56.9	134,103,000	68.2	91,507,000	70	83	65	85	403,880	8,259,538
1888	2,533,000	79.9	202,365,000	40.2	81,414,000	30	37	24	45	471,955	883,380
1889	2,648,000	77.4	204,881,000	35.4	72,611,000	33	45	30	60	406,618	3,415,578
1890	2,652,000	55.9	148,290,000	75.8	112,342,000	82	93	95	110	341,189	5,401,912
1891	2,715,000	93.7	254,424,000	35.8	91,013,000	30	40	30	50	557,022	186,871
1892	2,548,000	61.5	156,655,000	66.1	103,568,000	60	72	70	98	845,720	4,317,021
1893	2,605,000	70.3	183,034,000	59.4	108,662,000	51	60	64	88	803,111	3,002,578
1894	2,738,000	62.4	170,787,000	53.6	91,527,000	43	58	40	70	572,957	1,341,533
1895	2,955,000	100.6	297,237,000	26.6	78,985,000	18	24	10	23	680,049	175,240
1896	2,767,000	91.1	252,235,000	28.6	72,182,000	18	26	19	26	926,646	246,178
1897	2,535,000	64.7	164,016,000	54.7	89,643,000	50	62	60	87	605,187	1,171,378
1898	2,558,000	75.2	192,306,000	41.4	79,575,000	30	36	33	52	579,833	530,420
1899	2,581,000	88.6	228,783,000	39.0	89,329,000	35	46	27	39	809,472	155,861
1900	2,611,000	80.8	210,927,000	43.1	90,811,000	40	48	35	60	741,483	371,911
1901	2,864,000	65.5	187,598,000	76.7	143,979,000	75	82	58	100	528,484	7,656,162
1902	2,966,000	96.0	284,633,000	47.1	134,111,000	42	48	42	60	843,075	358,505
1903	2,917,000	84.7	247,128,000	61.4	151,638,000	60	66	95	116	484,042	3,166,581
1904	3,016,000	110.4	332,830,000	45.3	150,673,000	32	38	20	25	1,163,270	181,199
1905	2,997,000	87.0	260,741,000	61.7	160,821,000	55	66	48	73	1,000,326	1,948,160
1906	3,013,000	102.2	308,038,000	51.1	157,547,000	40	43	55	75	1,530,461	176,917
1907	3,128,000	95.4	298,262,000	61.8	184,184,000	46	58	50	80	1,203,894	403,952
1908	3,257,000	85.7	278,985,000	70.6	197,039,000	60	77	70	150	763,651	8,383,969
1909	3,525,000	106.8	376,537,000	54.9	206,545,000	20	58				

[a] Census figures of production. [b] White stock.

POTATOES—Continued.

Average yield per acre of potatoes in the United States.

State, Territory, or Division.	10-year averages. 1866-1875.	1876-1885.	1886-1895.	1896-1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Maine	119	119	110	143	126	150	130	190	215	175	210	145	225	223
New Hampshire	124	124	97	106	101	108	120	98	135	120	112	120	100	130
Vermont	141	141	99	112	134	90	94	138	128	98	101	120	73	155
Massachusetts	116	116	98	98	79	77	109	96	119	97	114	120	95	125
Rhode Island	96	96	102	122	94	98	164	120	137	125	108	110	150	125
Connecticut	99	99	83	94	96	81	92	96	96	92	98	100	80	120
New York	101	101	76	79	81	78	66	89	93	70	105	98	82	120
New Jersey	81	78	77	89	69	59	132	90	115	93	120	120	72	90
Pennsylvania	94	75	73	80	58	62	83	91	106	90	94	88	72	78
North Atlantic	105.3	100.1	81.5	88.3	80.2	80.1	85.4	103.0	112.4	91.8	115.2	104.3	95.8	119.9
Delaware	77	71	61	68	48	55	79	84	84	93	97	99	82	96
Maryland	71	71	68	74	55	60	80	70	99	95	93	95	77	80
Virginia	69	67	67	74	58	71	75	81	83	84	75	80	88	92
West Virginia	78	71	68	78	80	52	96	80	101	88	97	83	84	98
North Carolina	87	72	69	68	61	64	64	67	78	77	75	88	79	74
South Carolina	78	67	68	71	78	70	69	81	88	83	82	70	81	85
Georgia	81	62	65	60	68	64	58	73	70	65	77	83	78	81
Florida	111	69	73	75	60	62	90	82	102	75	85	80	83	95
South Atlantic	75.0	69.4	67.4	72.8	64.8	63.1	77.6	77.3	88.7	84.8	84.1	84.9	82.7	88.1
Ohio	85	74	65	75	76	54	94	83	98	78	110	76	77	93
Indiana	77	69	62	73	83	31	101	76	93	80	89	87	57	95
Illinois	76	79	63	80	92	35	118	72	108	75	97	87	71	91
Michigan	97	85	71	82	97	81	72	78	121	67	95	90	72	105
Wisconsin	89	85	75	92	103	75	115	58	126	68	97	91	80	102
N. Central E. of Miss. R.	85.2	78.8	67.6	82.4	90.6	62.7	97.7	72.2	113.6	71.9	98.0	87.2	73.4	99.1
Minnesota	105	100	85	87	81	68	98	64	102	82	92	101	76	115
Iowa	96	88	69	81	72	32	98	56	136	80	95	85	60	89
Missouri	82	78	71	75	93	17	128	66	96	82	84	82	80	85
North Dakota	.....	.....	80	95	52	110	105	84	111	95	98	89	85	110
South Dakota	.....	.....	57	81	73	45	74	89	96	96	100	84	90	80
Nebraska	87	84	60	83	66	33	137	64	120	93	87	73	78	78
Kansas	95	76	59	74	72	26	138	58	80	81	79	65	80	79
N. Central W. of Miss. R.	92.7	87.1	69.4	81.3	74.5	40.4	111.8	63.6	110.5	84.3	89.7	83.9	79.7	92.1
Kentucky	70	69	63	67	70	35	80	73	83	85	82	80	62	92
Tennessee	71	72	64	58	54	46	62	66	71	80	80	85	80	75
Alabama	72	71	65	64	69	67	50	67	61	80	75	95	85	80
Mississippi	78	70	66	74	66	62	69	82	82	110	85	90	91	87
Louisiana	85	63	67	64	70	60	65	50	70	64	62	67	82	75
Texas	104	70	66	64	62	54	66	67	72	64	77	73	71	50
Oklahoma	.....	.....	.....	75	82	59	91	74	77	76	80	70	78	70
Arkansas	83	81	71	65	72	46	72	70	77	65	80	70	82	70
South Central	73.6	70.8	64.8	65.4	66.2	48.5	71.9	69.3	75.3	75.3	78.4	77.1	75.5	71.0
Montana	.....	103	102	145	134	157	153	176	143	120	152	150	138	180
Wyoming	.....	94	102	138	99	113	100	167	161	170	115	200	158	160
Colorado	.....	79	91	109	56	120	100	145	159	160	125	150	125	160
New Mexico	.....	75	75	63	19	50	72	87	62	75	121	100	100	85
Utah	.....	96	96	139	118	114	157	177	137	132	165	100	160	180
Nevada	104	97	107	146	156	141	212	117	131	120	175	200	120	180
Idaho	.....	98	110	138	136	108	149	160	139	140	175	145	130	200
Washington	.....	120	120	132	116	117	136	145	120	142	129	150	120	170
Oregon	111	115	91	106	110	90	103	107	87	110	101	125	99	160
California	116	101	81	115	104	101	118	130	129	165	125	145	107	130
Far Western	114.5	103.8	93.3	119.1	95.7	110.5	120.4	139.4	130.0	143.3	128.4	143.0	119.7	161.4
United States	92.9	81.2	73.2	84.4	80.8	65.5	96.0	84.7	110.4	87.0	102.2	95.4	85.7	106.8

POTATOES—*Continued.*

Average farm value per acre of potatoes in the United States December 1.

State, Territory, or Division.	10-year averages. 1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	59.50	53.90	60.50	80.08	61.74	100.50	84.50	109.76	103.20	106.75	105.00	81.20	137.25	105.75
N. Hampshire	63.24	53.20	56.26	66.78	53.53	85.32	82.80	63.70	75.60	86.40	67.20	80.42	73.00	83.19
Vermont	54.99	55.00	48.51	58.24	53.60	57.60	54.52	69.00	60.16	69.58	55.55	63.62	48.93	68.20
Massachusetts	75.40	66.50	67.62	71.54	52.14	69.30	88.29	68.16	84.49	81.48	74.10	100.80	80.75	98.76
Rhode Island	67.20	65.12	71.40	91.50	65.80	91.14	123.00	102.50	104.12	111.25	86.40	102.33	129.00	100.00
Connecticut	66.33	56.16	55.61	67.68	67.20	76.14	67.16	74.88	69.12	83.72	70.56	77.00	72.00	99.61
New York	50.50	42.66	37.24	42.66	36.45	55.38	38.94	49.84	50.22	49.00	51.45	55.86	61.50	60.00
New Jersey	55.08	54.60	46.97	56.96	41.40	50.15	80.52	68.31	70.15	69.75	79.20	88.80	64.08	73.80
Pennsylvania	55.46	42.00	39.42	44.80	30.74	47.12	47.31	56.42	57.24	58.50	53.58	58.96	57.60	50.70
N. Atlantic	56.44	50.66	43.44	50.07	40.01	58.90	52.42	61.33	61.23	62.97	62.01	64.98	70.60	67.35
Delaware	51.59	45.44	32.94	39.44	28.80	42.90	40.29	47.04	44.52	54.87	57.23	64.38	68.00	69.11
Maryland	46.86	44.73	36.04	40.70	29.70	46.20	41.60	42.00	50.49	55.10	52.08	57.00	56.97	52.80
Virginia	38.64	38.19	35.51	42.92	34.22	52.54	43.50	53.76	45.65	47.04	50.25	54.39	63.37	64.40
W. Virginia	43.68	36.92	37.40	44.46	40.80	44.20	48.96	52.80	54.54	51.04	59.17	66.41	71.41	66.04
N. Carolina	52.20	46.80	41.40	44.20	39.65	46.08	42.88	49.58	54.60	52.36	55.50	68.65	60.84	59.92
S. Carolina	73.32	53.60	55.08	70.29	78.00	77.00	66.24	84.24	88.88	85.49	86.10	77.00	89.11	97.78
Georgia	80.19	55.80	54.60	54.60	52.36	67.84	52.20	68.62	74.90	72.80	84.70	83.00	85.80	81.00
Florida	125.43	62.10	67.16	88.50	63.60	79.98	109.80	103.32	131.58	90.00	93.50	76.00	112.00	114.00
S. Atlantic	46.95	41.99	38.62	46.37	38.36	51.27	47.11	51.08	54.97	54.65	57.99	62.57	67.48	66.10
Ohio	51.00	39.22	35.10	38.25	30.40	45.90	41.36	50.63	46.06	49.14	52.80	51.68	59.29	52.08
Indiana	44.66	34.50	34.72	37.23	31.54	27.90	41.41	50.16	41.85	46.40	50.73	56.55	47.88	49.40
Illinois	45.60	41.08	36.54	43.20	37.72	32.55	49.56	51.84	50.76	50.25	60.14	62.64	58.93	55.51
Michigan	48.50	38.25	29.82	31.98	25.22	55.08	29.52	38.22	35.09	37.52	32.30	40.50	41.76	36.75
Wisconsin	43.61	35.70	33.00	34.96	28.84	50.25	37.95	33.64	35.28	42.16	29.10	40.95	48.00	38.76
N. Central E. of Miss. River	47.54	38.38	34.14	36.34	30.68	46.11	38.24	42.35	40.29	43.94	41.08	47.52	49.62	43.98
Minnesota	51.45	36.00	33.15	32.19	24.30	45.56	30.38	39.04	29.58	41.00	34.04	41.41	42.56	40.25
Iowa	43.20	38.72	33.12	35.64	26.64	30.08	33.32	42.06	38.08	39.20	40.85	46.75	48.00	48.95
Missouri	46.74	37.44	34.79	39.75	32.55	18.02	44.80	50.16	46.08	45.10	47.88	59.03	59.20	56.95
N. Dakota	......	......	32.00	34.20	25.48	53.90	34.65	40.32	35.52	36.10	45.08	55.19	47.60	49.50
S. Dakota	......	......	27.93	31.59	26.28	38.25	32.56	48.06	28.80	36.48	35.00	42.00	45.91	50.40
Nebraska	54.81	34.44	32.40	39.01	32.34	34.65	36.99	41.60	31.20	34.41	45.24	51.10	42.90	46.80
Kansas	61.75	48.64	37.17	42.92	34.56	27.04	62.10	49.30	44.80	55.89	55.30	57.20	66.40	62.41
N. Central W. of Miss. River	48.95	39.28	34.21	36.83	29.30	33.08	38.53	43.58	36.45	41.36	42.89	49.42	49.89	49.55
Kentucky	40.60	34.50	35.28	38.19	35.00	30.45	42.40	49.64	45.65	45.05	50.02	60.00	50.21	58.88
Tennessee	41.18	36.72	33.28	36.54	31.32	39.56	39.68	42.24	44.02	46.40	49.60	64.59	56.79	53.27
Alabama	72.72	63.19	53.95	58.24	56.58	73.03	46.50	64.32	60.39	70.40	69.75	95.00	80.73	78.41
Mississippi	71.76	60.96	52.80	64.38	54.78	71.30	63.48	72.16	69.70	93.50	73.95	83.67	84.62	82.67
Louisiana	79.90	53.55	54.94	54.40	55.30	60.60	53.30	45.50	63.70	58.24	46.50	60.33	75.46	68.25
Texas	122.72	67.90	57.42	58.88	54.56	67.50	56.10	58.96	66.96	59.52	66.99	76.64	69.58	53.00
Oklahoma	......	......	......	67.50	53.30	73.81	65.23	68.79	58.70	64.86	62.08	70.00	76.44	66.52
Arkansas	70.55	59.13	44.02	48.10	41.04	57.96	48.96	55.30	57.75	47.45	53.60	63.68	70.53	64.39
S. Central	49.24	42.62	39.72	48.33	40.95	52.40	49.68	54.83	55.73	55.43	57.22	69.54	67.12	61.31
Montana	......	71.07	63.24	75.40	71.02	114.61	76.50	77.44	87.23	70.80	92.72	75.00	96.60	91.80
Wyoming	......	69.56	62.22	86.94	67.32	112.40	65.27	95.19	99.82	95.20	74.75	148.00	104.33	100.80
Colorado	......	65.57	46.41	64.31	45.92	108.00	51.00	87.00	58.83	91.20	56.25	99.00	75.00	91.20
N. Mexico	......	63.00	53.25	54.18	21.66	59.00	58.32	73.08	48.36	66.75	108.90	96.00	90.00	86.00
Utah	......	46.08	42.24	61.16	56.64	68.40	70.65	83.19	65.76	56.76	82.50	65.00	88.00	77.40
Nevada	186.16	92.15	60.99	105.12	87.36	128.31	133.56	81.90	85.15	98.40	122.50	180.00	90.00	153.00
Idaho	......	68.60	58.30	69.00	63.92	90.72	55.13	73.60	87.57	67.20	71.75	75.43	78.00	96.00
Washington	......	60.00	52.80	58.08	54.52	71.37	51.68	52.20	67.20	65.32	72.24	75.00	80.39	79.90
Oregon	75.48	60.95	43.68	54.06	49.50	63.00	56.65	53.50	61.33	66.00	56.56	70.00	67.33	96.00
California	111.36	72.72	45.36	70.15	55.12	77.77	68.44	85.80	86.43	110.55	92.50	130.50	82.39	100.10
Far Western	108.78	68.61	48.52	64.31	53.34	84.78	60.17	74.42	69.46	82.56	73.42	93.09	79.48	92.90
United States	51.00	42.95	37.19	42.12	34.78	50.27	45.22	51.99	49.96	53.67	52.29	58.86	60.50	58.59

POTATOES—*Continued.*

Average farm price of potatoes per bushel in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866-1875.	1876-1885.	1886-1895.	1896-1905.	1900	1901	1902	1903	1904	1905	1906	1907	1908	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
Maine	50	55	55	56	49	67	65	56	48	61	50	56	61	64	73	85	85	50	47
N. Hampshire	51	56	58	63	53	79	69	65	56	72	60	67	71	77	80	90	92	71	64
Vermont	39	50	49	52	40	64	58	50	47	71	55	53	67	72	77	97	90	54	41
Massachusetts	65	70	69	73	66	90	81	71	71	84	65	81	85	92	99	110	107	84	79
Rhode Island	70	74	70	75	70	93	75	82	76	89	80	95	86	95	99	104	104	78	80
Connecticut	67	72	67	72	70	91	73	78	72	91	72	77	90	90	97	105	108	86	83
New York	50	54	49	54	45	71	59	56	54	70	49	57	75	77	83	89	85	65	50
New Jersey	68	70	61	64	60	85	61	69	61	75	66	74	89	85	95	101	90	85	82
Pennsylvania	59	56	54	56	53	76	57	62	54	65	57	67	80	80	88	96	95	71	65
N. Atlantic	53.6	56.6	53.3	56.7	49.9	73.6	61.4	59.6	54.5	68.6	53.8	62.3	75.7	75.4	82.8	91.4	89.1	65.3	56.2
Delaware	67	64	54	58	60	78	51	56	54	59	59	65	83	80	83	90	75	70	72
Maryland	66	63	53	55	54	77	52	60	51	58	56	60	71	75	87	94	69	70	66
Virginia	56	57	53	58	59	74	58	64	55	56	67	68	72	75	89	93	72	73	70
West Virginia	56	52	55	57	51	85	51	66	54	58	61	80	85	89	97	103	80	68	68
North Carolina	60	65	60	65	65	72	67	74	70	68	74	78	77	70	103	97	79	80	81
South Carolina	*94*	*80*	*81*	*99*	*100*	*110*	*96*	*104*	*101*	*103*	*105*	*110*	*110*	73	*129*	*125*	*116*	*118*	*115*
Georgia	99	90	84	91	77	106	90	94	107	112	110	100	110	70	121	118	110	107	100
Florida	113	90	92	118	106	129	122	126	129	120	110	95	135	106	126	147	125	127	120
South Atlantic	62.6	60.5	57.3	63.7	59.2	81.2	60.7	69.9	62.0	64.5	69.0	73.7	81.6	77.6	96.5	99.9	79.6	78.6	75.1
Ohio	60	53	54	51	40	85	44	61	47	63	48	68	77	80	92	103	81	62	56
Indiana	58	50	56	51	38	90	41	66	45	58	57	65	84	85	100	112	74	60	52
Illinois	60	52	58	54	41	93	42	72	47	67	62	72	83	85	106	120	76	68	61
Michigan	50	45	42	39	26	68	41	49	29	56	31	45	58	61	71	86	76	48	35
Wisconsin	49	42	44	38	28	67	33	58	28	62	30	45	60	64	75	86	80	47	38
N. C. E. of Miss. River	55.8	48.7	50.5	44.1	33.9	73.5	39.1	58.7	35.5	61.1	41.9	54.5	67.6	70.6	83.2	94.1	77.9	54.0	44.4
Minnesota	49	36	39	37	30	67	31	61	29	50	37	41	56	60	71	85	68	36	35
Iowa	45	44	48	44	37	94	34	75	28	49	43	55	60	63	82	100	83	69	55
Missouri	57	48	49	53	35	106	35	76	48	55	57	72	74	80	96	105	67	70	67
North Dakota	...	...	40	36	49	49	33	48	32	38	46	62	56	60	74	90	81	45	45
South Dakota	...	...	49	39	36	85	44	54	30	38	35	50	51	57	64	90	88	65	63
Nebraska	63	41	54	47	49	105	27	65	26	37	52	70	55	61	71	92	74	68	60
Kansas	65	64	63	58	48	104	45	85	56	69	70	88	83	86	110	134	85	82	79
N. C. W. of Miss. River	52.8	45.1	49.3	45.3	39.3	81.8	34.5	68.6	33.0	49.1	47.8	58.9	62.6	66.9	81.9	99.6	76.8	61.9	53.8
Kentucky	58	50	56	57	50	87	53	68	55	53	61	75	81	87	109	116	70	64	64
Tennessee	58	51	52	63	58	86	64	64	62	58	62	76	71	75	101	97	62	67	71
Alabama	*101*	*89*	*83*	*91*	*82*	*109*	*93*	*96*	*99*	*88*	*93*	*100*	*95*	79	*130*	*111*	*95*	*97*	*98*
Mississippi	92	87	80	87	83	115	92	88	85	85	87	93	93	77	126	114	91	99	95
Louisiana	94	85	82	85	79	101	82	91	91	91	75	90	92	93	110	104	79	90	91
Texas	118	97	87	92	88	125	85	88	93	93	87	105	98	95	127	117	95	118	106
Oklahoma	...	...	...	90	65	125	71	93	76	85	77	100	98	95	117	133	71	104	95
Arkansas	85	73	62	74	57	126	68	79	75	73	67	91	86	90	122	109	68	89	92
South Central	66.9	60.2	61.3	73.9	61.9	108.1	69.1	79.2	74.0	73.6	73.0	90.2	88.9	87.9	117.6	113.4	77.9	91.8	86.3
Montana	...	69	62	52	53	73	50	44	61	59	61	50	70	75	104	126	120	70	51
Wyoming	...	74	61	63	68	100	61	57	62	56	65	74	66	70	74	88	100	62	63
Colorado	...	83	51	59	82	90	51	60	37	57	45	66	60	65	89	110	125	73	57
New Mexico	...	84	71	86	114	118	81	84	78	89	90	96	90	105	*117*	*140*	*125*	*115*	*101*
Utah	...	48	44	44	48	60	45	47	48	43	50	65	55	55	62	92	83	56	43
Nevada	179	95	57	72	56	91	63	70	65	82	70	90	75	110	96	111	155	100	85
Idaho	...	70	53	50	47	84	37	46	63	48	41	52	60	60	74	102	110	51	48
Washington	...	50	44	44	47	61	38	36	56	46	56	50	67	80	92	115	100	58	47
Oregon	68	53	48	51	45	70	55	50	59	60	56	56	68	65	95	120	120	66	60
California	96	72	56	61	53	77	58	66	67	67	74	90	77	95	103	130	98	83	77
Far Western	95.0	66.1	52.0	54.0	55.8	76.7	50.0	53.4	53.4	57.6	57.2	65.1	66.4	73.6	91.1	115.0	110.9	69.1	57.6
United States	54.9	52.9	50.8	49.9	43.1	76.7	47.1	61.4	45.3	61.7	51.1	61.8	70.6	73.3	86.3	97.7	85.1	64.3	54.9

POTATOES—Continued.

Wholesale prices of potatoes per bushel, 1896–1909.

Date.	Chicago.		Milwaukee.		St. Louis.		Cincinnati.	
	Burbank, per bushel.		Per bushel.		Burbank, per bushel.		Per bushel.[a]	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*		
1896	10	31	10	35	20	45	$0.60	$1.35
1897	18	62	15	100	21	65	.90	4.75
1898	29	87	25	90	30	85	1.25	3.75
1899	25	75	15	90	25	75	1.10	6.00
1900	25	50	20	80	27	54	.32	.57
1901	30	125	25	185	18	140	.30	1.20
1902	30	100	....	....	41	105	.90	3.00
1903	38	85	35	90	40	125	1.20	3.00
1904	31	122	20	120	36	125	1.20	4.80
1905	18	72	10	70	27	175	.25	.80
1906.								
January	55	66	45	58	58	82	.55	.65
February	47	57	35	50	53	61	.45	.62
March	43	68	35	62	51	70	.45	.75
April	57	63	50	62	65	68	.60	.85
May	48	73	45	75	60	88	.55	.75
June	60	87	50	80	65	125	.90	1.05
July	....	....	40	87	35	75	.75	.90
August	....	....	35	50	37	60	.58	.80
September	45	58	35	55	43	62	.55	.60
October	40	47	25	40	48	56	.50	.60
November	41	48	25	40	45	55	.45	.58
December	[b] 40	[b] 43	25	40	40	46	.45	.47
Year	40	87	25	87	35	125	.45	1.05
1907.								
January	34	45	25	45	43	53	.45	.50
February	37	48	25	45	51	56	.48	.53
March	33	47	25	45	43	55	.50	.53
April	33	61	25	60	63	68	.40	.80
May	55	75	40	70	74	75	.70	.80
June	32	70	30	70	60	78	.60	.70
July	30	50	35	90	50	125	.25	.85
August	....	....	30	90	60	95	.70	.80
September	50	60	45	75	45	72	.60	.85
October	45	65	40	75	55	70	.50	.62
November	45	63	40	65	53	65	.50	.65
December	46	58	40	65	55	64	.50	.65
Year	30	75	25	90	43	125	.25	.85
1908.								
January	52	65	53	75	62	69	.60	.68
February	58	73	65	70	67	77	.65	.82
March	62	75	63	70	71	78	.70	.80
April	60	77	65	80	73	78	.70	.85
May	50	80	58	80	65	74	.60	.85
June	53	150	58	150	100	105	.60	1.35
July	70	110	55	110	....	....	1.10	1.35
August	58	90	60	85	....	....	.85	1.15
September	58	78	60	80	72	72	.75	.85
October	50	81	54	80	67	70	.65	.80
November	57	71	58	70	69	72	.65	.75
December	60	77	64	70	69	75	.65	.80
Year	50	150	53	150	62	105	.60	1.35
1909.								
January	60	79	60	72	73	83	.72	.80
February	65	95	60	88	80	93	.75	.90
March	80	93	70	95	89	98	.85	.95
April	85	110	70	115	92	108	.95	1.15
May	70	150	80	135	85	102	.95	1.00
June	20	145	30	105	40	140	.90	1.20
July	15	125	20	100	40	110	.50	.95
August	38	66	40	90	35	62	.70	.75
September	42	65	45	65	45	72	.55	.70
October	35	55	40	60	42	56	.55	.60
November	15	50	30	50	40	52	.30	.60
December	20	58	30	50	40	50	.30	.48
Year	15	150	20	135	35	140	.30	1.20

[a] Per barrel for 1896–1899 and 1902–1904.

[b] Common to fancy.

POTATOES—Continued.

Average farm price of potatoes per bushel, monthly, 1908–9.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	72.0	63.4	74.5	64.9	83.2	76.0	69.4	55.5	64.1	62.5	92.1	92.7	66.9	62.7
February	73.3	......	75.4	......	77.6	......	70.6	......	66.9	......	87.9		73.6	..
March	80.0	69.0	77.2	73.0	90.3	84.2	77.1	59.7	72.3	66.0	118.2	100.5	83.5	64.1
April	86.3	70.4	82.8	73.0	96.5	85.8	83.2	64.8	81.9	67.2	117.6	104.9	91.1	59.8
May	97.3	73.3	93.6	79.2	101.3	86.4	97.6	66.8	94.2	67.3	119.5	104.8	100.5	61.6
June	97.7	71.3	91.4	72.3	99.9	86.1	94.1	67.7	99.6	68.3	113.4	94.4	115.0	61.6
July	91.0	77.8	91.2	76.4	94.5	80.6	79.5	80.6	91.8	75.9	93.0	86.0	115.1	68.7
August	85.1	83.6	89.1	93.2	79.6	74.9	77.9	85.9	76.8	73.4	77.9	80.8	110.0	69.6
September	71.5	78.0	77.6	87.8	76.7	75.3	59.9	77.0	65.3	64.3	84.2	82.6	81.1	75.2
October	64.3	74.8	65.3	80.3	78.0	74.7	54.0	74.9	61.9	64.0	91.8	87.1	69.1	70.9
November	57.8	69.2	58.5	71.9	76.7	76.5	47.2	67.3	56.2	61.1	89.0	88.2	58.0	67.8
December	54.9	70.6	56.2	73.7	75.1	81.6	44.4	67.6	53.8	62.6	86.3	88.9	57.6	66.4

Average yield of potatoes in countries named, bushels per acre, 1899–1908.

Year.	United States.	Russia, European.[b]	Germany.[b]	Austria.[b]	Hungary proper.[b]	France.[a]	United Kingdom.[a]
1899	88.6	102.0	182.7	163.1	117.4	117.2	179.9
1900	80.8	104.7	187.5	149.0	131.6	126.0	140.7
1901	65.5	92.2	218.1	155.8	126.8	115.6	216.9
1902	96.0	107.5	199.4	152.4	113.3	114.1	183.7
1903	84.7	91.1	197.0	126.2	125.0	120.2	166.1
1904	110.4	88.4	164.2	126.1	86.2	123.4	195.6
1905	87.0	106.6	216.7	182.5	126.8	142.5	218.8
1906	102.2	94.9	193.3	158.4	128.7	99.5	192.2
1907	95.4	102.4	205.3	173.2	126.6	107.7	171.0
1908	85.7	102.9	209.2	154.0	96.6	....	231.1
Average (1899–1908)	89.8	98.4	197.3	151.4	117.8	[c] 118.0	186.4

[a] Winchester bushels. [b] Bushels of 60 pounds. [c] Average 1898–1907.

HAY.

Acreage, production, value, prices, and exports of hay in the United States, 1849–1909.

Year.	Acreage.	Average yield per acre.	Production.	Average farm price per ton Dec. 1.	Farm value Dec. 1.	Chicago prices No. 1 timothy per ton, by carload lots. December. Low.	December. High.	May of following year. Low.	May of following year. High.	Domestic exports, fiscal year beginning July 1.
	Acres.	*Tons.* [a]	*Tons.* [a]	*Dolls.*	*Dollars.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Tons.* [b]
1849 [c]	......	......	13,839,000	......	......	......	......	......	......	......
1859 [c]	......	......	19,084,000	......	......	......	......	......	......	......
1866	17,669,000	1.23	21,779,000	10.14	220,836,000	......	......	......	......	5,028
1867	20,021,000	1.31	26,277,000	10.21	268,301,000	......	......	......	......	5,645
1868	21,542,000	1.21	26,142,000	10.08	263,589,000	......	......	......	......	......
1869	18,591,000	1.42	26,420,000	10.18	268,933,000	......	......	......	......	6,723
1870	19,862,000	1.23	24,525,000	12.47	305,743,000	......	......	......	......	4,581
1871	19,009,000	1.17	22,239,000	14.30	317,940,000	......	......	......	......	5,266
1872	20,319,000	1.17	23,813,000	12.94	308,025,000	......	......	......	......	4,557
1873	21,894,000	1.15	25,085,000	12.53	314,241,000	......	......	......	......	4,889
1874	21,770,000	1.15	25,134,000	11.94	300,222,000	......	......	......	......	7,183
1875	23,508,000	1.19	27,874,000	10.78	300,378,000	......	......	......	......	7,528
1876	25,283,000	1.22	30,867,000	8.97	276,991,000	......	......	9.00	10.00	7,287
1877	25,368,000	1.25	31,629,000	8.37	264,880,000	9.50	10.50	9.75	10.75	9,514
1878	26,931,000	1.47	39,608,000	7.20	285,016,000	8.00	8.50	9.00	11.50	8,127
1879	27,485,000	1.29	35,493,000	9.32	330,804,000	14.00	14.50	14.00	15.00	13,739
1880	25,864,000	1.23	31,925,000	11.65	371,811,000	15.00	15.50	17.00	19.00	12,662
1881	30,889,000	1.14	35,135,000	11.82	415,131,000	16.00	16.50	15.00	16.50	10,570
1882	32,340,000	1.18	38,138,000	9.73	371,170,000	11.50	12.25	12.00	13.00	13,309
1883	35,516,000	1.32	46,864,000	8.19	383,834,000	9.00	10.00	12.50	17.00	16,908
1884	38,572,000	1.26	48,470,000	8.17	396,139,000	10.00	11.50	15.50	17.50	11,142
1885	39,850,000	1.12	44,732,000	8.71	389,753,000	11.00	12.00	10.00	12.00	13,390
1886	36,502,000	1.15	41,796,000	8.46	353,438,000	9.50	10.50	11.00	12.50	13,873
1887	37,665,000	1.10	41,454,000	9.97	413,440,000	13.50	14.50	17.00	21.00	18,198
1888	38,592,000	1.21	46,643,000	8.76	408,500,000	11.00	11.50	10.50	11.00	21,928
1889	52,949,000	1.26	66,831,000	7.04	470,394,000	9.00	10.00	9.00	14.00	36,274
1890	50,713,000	1.19	60,198,000	7.87	473,570,000	9.00	10.50	12.50	15.50	28,066
1891	51,044,000	1.19	60,818,000	8.12	494,114,000	12.50	15.00	13.50	14.00	35,201
1892	50,853,000	1.18	59,824,000	8.20	490,428,000	11.00	11.50	12.00	13.50	33,084
1893	49,613,000	1.33	65,766,000	8.68	570,883,000	10.00	10.50	10.00	10.50	54,446
1894	48,321,000	1.14	54,874,000	8.54	468,578,000	10.00	11.00	10.00	10.25	47,117
1895	44,206,000	1.06	47,079,000	8.35	393,186,000	12.00	12.50	11.50	12.00	59,052
1896	43,260,000	1.37	59,282,000	6.55	388,146,000	8.00	8.50	8.50	9.00	61,658
1897	42,427,000	1.43	60,665,000	6.62	401,391,000	8.00	8.50	9.50	10.50	81,827
1898	42,781,000	1.55	66,377,000	6.00	398,061,000	8.00	8.25	9.50	10.50	64,916
1899	41,328,000	1.35	56,656,000	7.27	411,926,000	10.50	11.50	10.50	12.50	72,716
1900	39,133,000	1.28	50,111,000	8.89	445,539,000	11.50	14.00	12.50	13.50	89,364
1901	39,391,000	1.28	50,591,000	10.01	506,192,000	13.00	13.50	12.50	13.50	153,431
1902	39,825,000	1.50	59,858,000	9.06	542,036,000	12.00	12.50	13.50	15.00	50,974
1903	39,934,000	1.54	61,306,000	9.08	556,377,000	10.00	12.00	12.00	15.00	60,730
1904	*39,999,000*	*1.52*	*60,696,000*	*8.72*	*529,108,000*	*10.50*	*11.50*	*11.00*	*12.00*	66,557
1905	39,362,000	1.54	60,532,000	8.52	515,960,000	10.00	12.00	11.50	12.50	70,172
1906	42,476,000	1.35	57,146,000	10.37	592,540,000	15.50	18.00	15.50	20.50	58,602
1907	44,028,000	1.45	63,677,000	11.68	743,507,000	13.00	17.50	13.00	14.00	77,281
1908	46,486,000	1.52	70,798,000	8.98	635,423,000	11.50	12.00	12.00	13.00	64,641
1909	45,744,000	1.42	64,938,000	10.62	689,345,000	16.00	17.00	......	......	......

[a] 2,000 pounds. [b] 2,240 pounds. [c] Census figures.

HAY—Continued.

Acreage, production, and value of hay in the United States, 1909.

State, Territory, or Division.	Acreage.	Production.	Farm value December 1.
	Acres.	*Tons.*	*Dollars.*
Maine	1,400,000	1,330,000	19,551,000
New Hampshire	640,000	621,000	11,116,000
Vermont	879,000	1,009,000	16,155,000
Massachusetts	585,000	673,000	12,720,000
Rhode Island	62,000	68,000	1,265,000
Connecticut	490,000	564,000	10,885,000
New York	4,764,000	5,002,000	71,028,000
New Jersey	437,000	546,000	9,009,000
Pennsylvania	3,118,000	3,742,000	54,633,000
N. Atlantic	12,375,000	13,645,000	206,362,000
Delaware	78,000	109,000	1,635,000
Maryland	297,000	356,000	5,126,000
Virginia	466,000	606,000	8,060,000
West Virginia	675,000	844,000	11,225,000
North Carolina	175,000	242,000	3,485,000
South Carolina	66,000	81,000	1,256,000
Georgia	87,000	117,000	1,849,000
Florida	19,000	26,000	390,000
S. Atlantic	1,863,000	2,381,000	33,026,000
Ohio	2,820,000	4,033,000	43,960,000
Indiana	2,200,000	3,080,000	32,340,000
Illinois	2,852,000	4,135,000	40,936,000
Michigan	2,618,000	3,403,000	38,794,000
Wisconsin	2,369,000	3,625,000	34,800,000
N. C. E. of Miss. R.	12,859,000	18,276,000	190,830,000
Minnesota	927,000	1,622,000	9,732,000
Iowa	3,648,000	5,983,000	42,479,000
Missouri	2,755,000	3,719,000	30,868,000
North Dakota	194,000	266,000	1,330,000
South Dakota	536,000	804,000	4,100,000
Nebraska	1,550,000	2,325,000	13,950,000
Kansas	1,829,000	2,652,000	15,912,000
N. C. W. of Miss. R.	11,439,000	17,371,000	118,371,000
Kentucky	480,000	654,000	7,771,000
Tennessee	450,000	675,000	8,640,000
Alabama	111,000	166,000	2,241,000
Mississippi	83,000	122,000	1,403,000
Louisiana	23,000	34,000	304,000
Texas	618,000	587,000	6,985,000
Oklahoma	900,000	810,000	5,913,000
Arkansas	198,000	248,000	2,678,000
S. Central	2,863,000	3,295,000	35,935,000
Montana	556,000	995,000	9,950,000
Wyoming	277,000	665,000	5,918,000
Colorado	704,000	1,760,000	17,600,000
New Mexico	185,000	481,000	5,339,000
Arizona	109,000	360,000	4,608,000
Utah	375,000	1,088,000	9,792,000
Nevada	210,000	494,000	5,187,000
Idaho	477,000	1,359,000	12,367,000
Washington	380,000	798,000	11,172,000
Oregon	422,000	865,000	10,120,000
California	650,000	1,105,000	12,708,000
Far Western	4,345,000	9,970,000	104,761,000
United States	45,744,000	64,938,000	689,345,000

Average farm price of hay per ton, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Central States East of Miss. R.		N. Central States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908	1909.	1908.	1909.	1908.	1909	1908.
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
January	9.09	11.28	12.98	15.17	12.59	14.89	8.54	11.58	5.98	7.30	8.76	11.32	9.29	9.25
February	9.27	......	12.99	......	12.49	......	8.69	......	6.12	......	8.63	......	10.12	......
March	9.47	11.02	13.15	15.14	12.57	14.76	8.85	10.94	6.28	6.86	9.10	11.26	10.47	9.44
April	9.65	10.83	12.89	14.73	12.75	15.04	8.93	10.89	6.74	6.70	9.38	11.81	11.02	9.08
May	10.12	10.78	13.16	15.06	12.91	14.78	9.34	10.43	7.36	6.73	9.48	11.83	11.89	9.01
June	10.70	10.66	13.57	14.78	13.05	14.56	10.21	10.08	7.79	6.62	9.72	11.32	12.68	9.21
July	10.50	9.79	14.01	13.67	13.20	13.36	10.00	8.66	7.41	6.45	9.30	10.63	11.67	8.94
August	9.74	9.28	13.83	13.09	13.21	12.49	9.13	8.11	6.42	6.08	8.89	9.90	10.35	8.58
September	9.67	9.18	13.71	12.95	13.07	12.35	9.27	8.21	6.27	5.74	9.44	9.46	9.74	8.81
October	10.03	9.23	14.44	12.99	13.22	12.26	9.55	8.22	6.47	5.93	9.93	9.35	9.99	8.82
November	10.35	9.22	14.67	12.91	13.43	11.95	10.07	8.35	6.78	5.78	10.08	9.44	10.11	8.99
December	10.62	8.98	15.12	13.00	13.87	12.14	10.44	8.48	6.81	5.80	10.92	8.57	10.51	9.05

HAY—Continued.

Average yield per acre of hay in the United States.

State, Territory, or Division.	10-year averages. 1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Maine	0.87	0.98	0.96	1.04	0.90	1.05	1.07	0.98	1.10	1.08	1.20	1.50	0.90	0.95
N. Hampshire	1.00	.96	.97	1.06	.87	1.28	1.06	.92	1.02	1.16	1.15	1.35	.92	.97
Vermont	1.05	1.06	1.14	1.28	1.24	1.36	1.27	1.18	1.25	1.35	1.20	1.60	1.11	1.25
Massachusetts	1.10	1.14	1.13	1.29	.97	1.21	1.60	1.36	1.23	1.33	1.31	1.30	1.20	1.15
Rhode Island	1.04	1.04	.94	1.05	.92	.92	1.03	1.07	1.16	1.09	1.06	1.35	1.50	1.10
Connecticut	1.23	1.09	1.01	1.11	.89	1.01	1.35	1.11	1.06	1.12	1.17	1.30	1.20	1.15
New York	1.21	1.16	1.12	1.20	.81	1.30	1.34	1.26	1.36	1.30	1.28	1.25	1.20	1.05
New Jersey	1.27	1.16	1.17	1.28	1.26	1.32	1.22	1.28	1.39	1.13	1.32	1.45	1.60	1.25
Pennsylvania	1.19	1.21	1.15	1.28	1.10	1.19	1.19	1.27	1.45	1.50	1.30	1.45	1.50	1.20
N. Atlantic	1.15	1.13	1.10	1.21	.95	1.24	1.26	1.21	1.31	1.31	1.26	1.37	1.24	1.10
Delaware	1.13	1.04	1.13	1.28	.98	1.12	1.09	1.64	1.59	1.55	1.25	1.40	1.60	1.40
Maryland	1.12	1.10	1.15	1.18	1.09	1.22	1.01	1.24	1.36	1.30	1.26	1.40	1.60	1.20
Virginia	1.19	1.19	1.06	1.20	1.16	1.20	1.06	1.30	1.39	1.30	1.25	1.40	1.30	1.30
W. Virginia	1.16	1.16	1.00	1.34	1.18	1.37	1.12	1.38	1.47	1.48	1.40	1.45	1.45	1.25
N. Carolina	1.29	1.27	1.27	1.51	1.41	1.66	1.44	1.60	1.72	1.60	1.54	1.50	1.50	1.38
S. Carolina	.99	1.17	1.21	1.36	1.32	1.46	1.22	1.46	1.53	1.42	1.46	1.50	1.25	1.23
Georgia	1.25	1.37	1.25	1.50	1.69	1.40	1.36	1.53	1.52	1.50	1.65	1.75	1.75	1.35
Florida	......	......	1.38	1.37	1.20	1.48	1.24	1.47	1.36	1.48	1.50	1.35	1.35	1.38
S. Atlantic	1.17	1.16	1.09	1.30	1.22	1.31	1.12	1.37	1.46	1.41	1.36	1.45	1.45	1.28
Ohio	1.20	1.24	1.17	1.36	1.06	1.36	1.43	1.42	1.43	1.49	1.22	1.45	1.53	1.43
Indiana	1.28	1.32	1.17	1.38	1.21	1.27	1.46	1.47	1.37	1.48	1.10	1.35	1.56	1.40
Illinois	1.36	1.38	1.17	1.36	1.27	1.08	1.50	1.54	1.36	1.35	.98	1.40	1.53	1.45
Michigan	1.22	1.29	1.15	1.33	1.29	1.26	1.45	1.37	1.25	1.46	1.28	1.25	1.45	1.30
Wisconsin	1.34	1.31	1.18	1.53	1.15	1.29	1.90	1.89	1.67	1.80	1.35	1.35	1.70	1.53
N. Central E. of Miss. R.	1.28	1.31	1.17	1.39	1.20	1.25	1.53	1.52	1.41	1.50	1.18	1.36	1.54	1.42
Minnesota	1.32	1.41	1.26	1.66	1.16	1.55	1.76	1.84	1.74	1.75	1.70	1.70	1.68	1.75
Iowa	1.53	1.38	1.19	1.58	1.42	1.25	1.68	1.78	1.62	1.70	1.35	1.40	1.70	1.64
Missouri	1.46	1.28	1.15	1.33	1.29	.75	1.59	1.57	1.47	1.10	.78	1.40	1.50	1.35
N. Dakota	......	......	1.17	1.48	.92	1.60	1.66	1.18	1.57	1.55	1.45	1.30	1.30	1.37
S. Dakota	......	......	1.07	1.34	1.18	1.15	1.23	1.45	1.43	1.60	1.50	1.40	1.50	1.50
Nebraska	1.56	1.45	1.13	1.61	1.38	1.25	1.74	1.68	1.76	1.75	1.40	1.50	1.55	1.50
Kansas	1.54	1.38	1.16	1.45	1.32	.91	1.70	1.58	1.67	1.55	1.28	1.15	1.50	1.45
N. Central W. of Miss. R.	1.48	1.37	1.17	1.50	1.31	1.08	1.66	1.66	1.60	1.50	1.23	1.40	1.58	1.52
Kentucky	1.26	1.27	1.17	1.35	1.40	1.34	1.44	1.46	1.44	1.30	1.35	1.35	1.35	1.38
Tennessee	1.32	1.27	1.22	1.49	1.40	1.52	1.44	1.58	1.66	1.60	1.51	1.50	1.50	1.50
Alabama	1.22	1.34	1.44	1.69	1.85	1.75	1.50	1.77	1.71	1.90	1.95	1.80	1.60	1.50
Mississippi	1.27	1.36	1.44	1.62	1.75	1.69	1.40	1.74	1.72	1.75	1.90	1.60	1.50	1.47
Louisiana	1.45	1.17	1.49	1.99	2.00	1.85	1.80	2.04	2.06	2.30	1.93	2.00	1.40	1.50
Texas	1.41	1.31	1.21	1.53	1.80	1.25	1.40	1.84	1.77	1.90	1.80	1.30	1.65	.95
Oklahoma	......	......	1.32	1.35	1.43	1.04	1.27	1.36	1.50	1.41	1.40	1.20	1.45	.90
Arkansas	1.37	1.35	1.20	1.49	1.63	1.10	1.60	1.60	1.72	1.75	1.60	1.25	1.50	1.25
S. Central	1.29	1.27	1.22	1.46	1.60	1.33	1.41	1.59	1.61	1.58	1.54	1.37	1.50	1.15
Montana	......	1.09	1.13	1.64	1.60	1.79	1.68	2.08	1.92	1.60	1.85	1.70	2.00	1.79
Wyoming	......	1.21	1.17	1.86	1.68	1.76	1.65	2.14	2.27	2.50	2.25	2.10	2.00	2.40
Colorado	......	1.18	1.63	2.20	2.23	2.08	1.92	2.56	1.85	2.65	2.50	2.70	2.50	2.50
New Mexico	......	1.14	1.49	2.64	2.06	2.31	2.40	2.36	2.58	2.70	2.50	2.05	2.00	2.60
Arizona	......	1.00	1.47	2.98	2.31	2.85	2.34	3.46	2.71	3.75	3.50	2.90	3.20	3.30
Utah	......	1.30	1.66	2.89	2.65	2.45	2.62	2.95	3.54	3.25	4.00	2.10	2.50	2.90
Nevada	1.41	1.35	1.90	2.60	2.43	2.50	2.91	3.12	3.04	2.50	1.50	1.75	2.00	2.35
Idaho	......	1.21	1.64	2.79	2.80	2.58	2.67	2.82	3.07	3.10	2.95	2.40	3.25	2.85
Washington	......	1.34	1.50	2.20	2.16	2.30	2.29	2.41	2.18	2.65	2.38	2.10	2.25	2.10
Oregon	1.46	1.56	1.52	2.06	2.35	2.07	2.04	2.07	2.04	2.30	2.18	2.00	2.00	2.05
California	1.42	1.47	1.51	1.81	1.51	1.82	1.81	2.08	2.03	2.40	1.85	1.75	1.35	1.70
Far Western	1.43	1.41	1.51	2.09	1.95	2.14	2.13	2.45	2.34	2.58	2.43	2.12	2.22	2.29
United States	*1.22*	*1.25*	*1.18*	*1.44*	*1.28*	*1.28*	*1.50*	*1.54*	*1.52*	*1.54*	*1.35*	*1.45*	*1.52*	*1.42*

HAY—Continued.

Average farm value per acre of hay in the United States December 1.

State, Territory, or Division.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	11.29	11.13	10.20	10.50	11.66	10.96	10.74	10.00	10.69	10.69	12.30	18.75	12.40	13.06
N. Hampshire	13.34	11.08	11.19	13.42	13.48	15.87	14.36	12.20	13.76	15.08	14.38	21.26	14.72	17.37
Vermont	12.10	10.83	11.15	12.21	13.70	13.36	12.26	12.84	11.85	12.73	12.06	20.40	14.99	18.38
Massachusetts	21.80	18.90	18.00	20.27	16.88	21.16	26.64	22.71	19.58	20.24	22.27	24.68	20.40	21.74
Rhode Island	22.99	18.26	15.48	17.87	17.20	17.54	19.46	20.28	20.16	17.73	18.44	25.65	25.87	20.40
Connecticut	23.84	17.09	15.38	16.11	14.89	14.77	21.19	16.86	15.78	16.35	17.55	22.10	18.96	22.21
New York	16.32	13.36	11.89	12.41	11.38	13.75	14.11	13.81	14.20	13.49	15.49	19.37	14.70	14.91
New Jersey	23.95	17.75	15.57	18.04	20.22	18.86	19.08	19.70	20.39	16.74	21.05	24.06	22.59	20.62
Pennsylvania	16.99	14.45	12.76	15.30	15.29	15.90	16.66	17.15	17.14	17.90	17.42	22.84	18.00	17.52
N. Atlantic	16.43	13.73	11.43	13.76	13.45	14.72	15.32	14.88	14.94	14.90	15.94	20.91	16.12	16.68
Delaware	19.64	15.56	14.50	16.15	13.67	13.84	15.73	24.32	22.09	21.19	18.75	24.45	20.03	20.96
Maryland	19.06	15.06	13.29	14.57	15.31	16.07	14.19	17.38	16.97	15.50	17.01	22.39	19.20	17.26
Virginia	15.98	15.21	12.13	14.04	15.43	14.41	14.39	17.85	17.44	16.41	19.37	22.06	15.94	17.30
W. Virginia	12.13	11.44	10.34	15.53	15.81	18.91	16.05	19.04	18.24	17.24	19.60	22.48	15.95	16.63
N. Carolina	14.01	14.11	14.17	17.35	15.79	17.93	17.64	21.47	25.04	20.48	23.10	24.60	20.21	19.91
S. Carolina	19.34	15.57	13.93	15.45	15.18	16.03	13.72	17.11	18.64	18.97	22.27	24.89	18.45	19.03
Georgia	22.96	19.33	16.22	20.32	21.55	20.92	18.22	23.18	23.01	23.63	25.99	31.45	25.07	21.25
Florida	24.49	17.74	21.24	20.93	16.44	22.72	19.02	27.67	22.67	24.05	22.50	25.64	20.26	20.63
S. Atlantic	16.03	14.27	12.31	15.57	15.89	16.80	15.41	19.06	18.80	17.61	19.81	23.27	17.60	17.73
Ohio	13.15	12.19	11.02	11.71	11.71	11.86	14.59	14.20	13.23	11.92	14.64	17.05	13.31	15.59
Indiana	12.48	11.25	10.26	10.89	11.80	11.79	12.66	12.58	11.75	11.16	13.75	16.20	13.20	14.70
Illinois	11.12	10.45	9.49	10.87	10.67	12.10	13.31	12.83	11.78	11.16	12.25	15.40	12.55	14.35
Michigan	14.46	13.61	11.29	11.17	12.19	10.85	12.03	12.23	11.36	11.24	13.25	15.62	12.69	14.82
Wisconsin	11.62	11.28	9.51	11.66	11.10	13.58	15.03	14.17	13.18	13.05	12.15	15.53	13.60	14.69
N. Central E. of Miss. R.	12.44	11.51	10.25	11.26	11.48	11.96	13.53	13.22	12.27	11.67	13.25	15.95	13.06	14.84
Minnesota	6.38	7.28	6.27	8.67	8.06	8.65	9.43	12.16	9.59	10.15	9.35	12.75	9.07	10.50
Iowa	8.23	6.73	7.02	8.61	9.66	9.59	10.92	9.72	8.68	8.67	9.45	11.20	9.60	11.64
Missouri	13.17	10.23	8.10	9.31	8.97	8.99	10.96	10.49	9.73	8.62	7.80	12.95	10.50	11.20
N. Dakota	......	......	4.74	5.82	5.20	5.84	6.09	5.48	6.61	6.71	6.52	8.45	6.24	6.86
S. Dakota	......	......	4.28	5.04	4.66	5.16	5.10	6.71	6.06	6.43	6.75	7.70	6.15	7.65
Nebraska	6.35	5.08	4.85	6.54	7.11	7.71	7.59	7.53	6.72	7.24	7.84	9.37	7.59	9.00
Kansas	6.64	5.74	5.10	6.38	6.01	7.25	7.33	7.60	7.31	7.87	8.00	8.34	8.55	8.70
N. Central W. of Miss. R.	8.41	6.93	6.17	7.52	7.54	8.66	9.69	9.53	8.63	8.47	8.47	10.91	9.16	10.35
Kentucky	14.88	13.36	12.17	14.58	15.89	16.25	16.27	17.62	16.57	13.82	17.89	18.22	14.85	16.19
Tennessee	18.93	15.29	13.05	16.82	16.52	18.71	16.99	19.42	19.94	18.43	20.31	22.48	17.70	19.20
Alabama	20.00	19.05	17.34	18.93	19.52	21.12	17.42	21.93	20.74	23.79	25.93	27.45	20.00	20.19
Mississippi	21.76	19.61	15.55	16.35	17.41	17.62	14.35	20.18	18.66	19.55	21.76	20.80	16.57	16.90
Louisiana	24.50	15.71	15.26	20.66	18.80	20.50	21.10	23.15	25.13	26.45	22.20	30.00	15.50	15.83
Texas	16.95	13.78	10.43	11.92	12.24	13.27	12.04	15.09	14.37	15.43	15.30	13.97	13.61	11.30
Oklahoma	......	......	10.40	7.56	6.09	7.29	6.66	7.70	7.33	6.99	8.00	7.79	7.25	6.57
Arkansas	20.10	16.97	11.75	13.48	14.43	12.89	15.04	15.17	16.89	16.80	15.84	14.68	14.63	13.53
S. Central	16.81	14.53	12.22	12.31	15.12	14.72	13.71	15.93	15.29	14.45	16.13	16.47	12.86	12.57
Montana	......	11.96	11.10	12.91	13.92	14.60	12.67	18.32	16.70	12.32	16.46	16.15	16.70	17.90
Wyoming	......	14.59	9.90	12.28	12.26	12.64	12.01	14.27	13.05	15.52	17.44	15.75	14.80	21.36
Colorado	......	18.64	13.84	16.15	16.95	18.80	18.99	19.15	12.41	21.73	23.75	25.65	21.87	25.00
New Mexico	......	16.24	15.03	25.19	20.39	23.89	26.83	26.24	29.46	29.03	26.88	24.09	19.00	28.86
Arizona	......	14.50	14.74	31.71	26.10	26.16	28.62	35.78	40.22	46.39	42.00	40.60	39.09	42.28
Utah	......	8.15	11.07	18.76	21.07	20.70	19.18	20.18	22.34	21.68	30.00	14.71	18.51	26.11
Nevada	29.02	16.74	15.71	19.55	18.71	19.80	29.73	31.11	23.10	21.25	12.00	17.47	17.60	24.70
Idaho	......	13.01	11.97	16.18	18.20	15.25	14.69	19.64	18.67	18.29	23.60	20.39	23.07	25.93
Washington	......	14.74	13.56	20.53	20.52	19.60	20.45	30.78	24.72	25.63	26.18	31.52	24.74	29.40
Oregon	18.83	17.50	12.90	16.07	15.98	14.82	15.26	21.07	20.77	17.80	17.11	20.50	18.60	23.98
California	23.08	17.85	14.44	17.23	12.31	14.41	17.03	24.25	21.13	24.12	20.81	21.88	17.89	19.55
Far Western	23.01	16.61	13.45	16.91	15.27	17.18	17.66	22.16	19.36	21.02	22.11	21.71	20.09	24.11
United States	14.10	11.51	9.91	11.62	11.39	12.85	13.61	13.93	13.23	13.11	13.95	16.89	13.67	15.07

HAY—Continued.

Average farm price of hay per ton in the United States.

State, Territory, or Division.	Price December 1, by decades.				Price December 1, by years.									Price bimonthly, 1909.					
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Feb. 1.	Apr. 1.	June 1.	Aug. 1.	Oct. 1.	Dec. 1.
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
Maine	12.98	11.36	10.62	10.10	12.95	10.44	10.04	10.20	9.72	9.90	10.25	12.50	14.00	14.25	14.25	15.00	14.50	14.00	14.70
New Hampshire	13.34	11.54	11.54	12.66	15.50	12.40	13.55	13.26	13.49	13.00	12.50	15.75	16.00	17.50	16.00	17.10	17.00	17.00	17.90
Vermont	11.52	10.22	9.78	9.54	11.05	9.82	9.65	10.88	9.48	9.43	10.00	12.75	13.50	14.00	14.00	13.90	13.20	13.40	14.70
Massachusetts	19.82	16.58	15.93	15.71	17.40	17.49	16.65	16.72	15.76	15.22	17.00	19.00	17.00	18.00	17.70	17.90	17.50	18.50	18.90
Rhode Island	22.11	17.56	16.47	17.02	18.70	19.06	18.89	18.95	17.38	16.27	17.40	19.00	17.25	20.75	18.40	18.30	18.00	19.00	18.60
Connecticut	19.38	15.68	15.23	14.51	16.73	14.62	15.70	15.19	14.89	14.60	15.00	17.00	15.75	18.00	16.30	16.40	17.50	16.80	19.30
New York	13.49	11.52	10.62	10.34	14.05	10.58	10.53	10.96	10.44	10.38	12.10	15.50	12.25	12.00	11.75	13.10	13.40	13.80	14.20
New Jersey	18.86	15.30	13.31	14.09	16.05	14.29	15.64	15.39	14.67	14.81	15.95	17.00	14.00	15.00	14.75	14.70	14.50	15.10	16.50
Pennsylvania	14.28	11.94	11.10	11.95	13.00	13.64	14.00	13.50	11.82	11.93	13.40	15.75	12.00	11.25	11.75	12.00	12.70	14.10	14.60
North Atlantic	14.29	12.15	11.30	11.37	14.10	11.92	12.13	12.31	11.39	11.37	12.64	15.26	13.00	12.99	12.89	13.57	13.83	14.44	15.12
Delaware	17.38	14.96	12.83	12.62	13.95	12.36	14.43	14.83	13.89	13.67	15.00	17.50	12.50	11.00	12.75	13.50	14.30	16.00	15.00
Maryland	17.02	13.69	11.56	12.35	14.05	13.17	14.05	14.02	12.48	11.92	13.50	16.00	12.00	12.50	11.75	12.70	13.30	13.50	14.40
Virginia	13.43	12.78	11.44	11.70	13.30	12.01	13.58	13.73	12.55	12.62	15.50	15.75	12.25	12.00	12.60	12.50	12.60	13.10	13.30
West Virginia	10.46	9.86	10.34	11.59	13.40	13.80	14.33	13.80	12.41	11.65	14.00	15.50	11.00	12.00	12.00	12.20	12.00	11.80	13.30
North Carolina	10.86	11.11	11.16	11.49	11.20	10.80	12.25	13.42	14.56	12.80	15.00	16.50	13.50	13.75	14.00	14.30	14.00	13.60	14.40
South Carolina	19.54	13.31	11.51	11.36	11.50	10.98	11.25	11.72	12.18	13.36	15.25	16.50	14.80	15.25	16.10	16.00	16.60	15.30	15.50
Georgia	18.37	14.11	12.98	13.55	12.75	14.33	13.40	15.15	15.14	15.75	15.75	18.00	14.35	14.50	16.50	16.70	16.90	15.90	15.80
Florida	15.21	16.74	15.39	15.28	13.70	15.35	15.34	18.82	16.67	16.25	15.00	19.00	14.80	15.25	15.50	17.00	16.50	14.90	15.00
South Atlantic	13.70	12.30	11.29	11.98	13.05	12.78	13.70	13.88	12.90	12.49	14.60	16.05	12.14	12.49	12.75	13.05	13.21	13.22	13.87
Ohio	10.96	9.83	9.42	8.61	11.05	8.72	10.20	10.00	9.25	8.00	12.00	11.75	8.70	9.00	9.25	9.80	9.00	10.00	10.90
Indiana	9.75	8.52	8.77	7.89	9.75	9.28	8.67	8.56	8.58	7.54	12.50	12.00	8.80	9.25	9.30	10.50	8.90	9.30	10.50
Illinois	8.18	7.57	8.11	7.99	8.40	11.20	8.87	8.33	8.66	8.27	12.50	11.00	8.20	8.25	8.80	9.90	8.90	9.30	9.90
Michigan	11.85	10.55	9.82	8.40	9.45	8.61	8.30	8.93	9.09	7.70	10.35	12.50	8.75	8.75	9.30	11.20	10.20	10.50	11.40
Wisconsin	8.67	8.61	8.06	7.62	9.65	10.53	7.91	7.50	7.89	7.25	9.00	11.50	8.00	8.25	8.00	9.80	8.70	8.60	9.60
N. C. E. of Miss. River	9.72	8.79	8.76	8.10	9.59	9.56	8.86	8.69	8.72	7.78	11.19	11.73	8.48	8.69	8.93	10.21	9.13	9.55	10.44
Minnesota	4.83	5.16	4.98	5.22	6.95	5.58	5.36	6.61	5.51	5.80	5.50	7.50	5.40	5.25	5.25	6.80	5.70	5.30	6.00
Iowa	5.38	4.88	5.90	5.45	6.80	7.67	6.50	5.46	5.36	5.10	7.00	8.00	5.70	6.00	7.00	8.60	6.50	6.60	7.10
Missouri	9.02	7.99	7.04	7.00	6.95	11.99	6.89	6.68	6.62	7.84	10.00	9.25	7.00	7.25	8.20	8.50	7.70	8.10	8.30
North Dakota	......	......	4.05	3.93	5.65	3.65	3.67	4.64	4.21	4.33	4.50	6.50	4.80	4.75	5.50	7.30	5.20	4.80	5.00
South Dakota	......	......	4.00	3.76	3.95	4.49	4.15	4.63	4.24	4.02	4.56	5.50	4.10	4.75	5.20	6.20	4.70	4.40	5.10

Nebraska	4.07	3.50	4.29	4.08	5.15	6.17	4.36	4.48	3.82	4.14	5.60	6.25	4.90	5.50	5.40	6.40	5.50	5.40	6.00
Kansas	4.31	4.16	4.40	4.40	4.55	7.97	4.31	4.81	4.38	5.08	6.25	7.25	5.70	6.00	6.30	7.00	5.90	5.80	6.00
N. C. W. of Miss. River	5.68	5.06	5.27	5.01	5.76	8.02	5.84	5.73	5.40	5.66	6.88	7.79	5.80	6.12	6.74	7.79	6.42	6.47	6.81
Kentucky	11.81	10.52	10.40	10.80	11.35	12.13	11.30	12.07	11.51	10.63	13.25	13.50	11.00	11.50	11.60	12.20	11.30	11.40	11.90
Tennessee	14.34	12.04	10.70	11.29	11.80	12.31	11.80	12.29	12.01	11.52	13.45	15.00	11.80	11.75	12.90	13.00	11.90	12.60	12.80
Alabama	16.39	14.22	12.04	11.20	10.55	12.07	11.61	12.39	12.13	12.52	13.30	15.25	12.50	12.50	13.60	14.30	12.50	13.00	13.50
Mississippi	17.13	14.42	10.80	10.09	9.95	10.51	10.25	11.60	10.85	11.17	11.45	13.00	11.00	11.00	12.20	12.10	12.20	11.40	11.50
Louisiana	16.90	13.43	10.24	10.38	9.40	11.08	11.72	11.35	12.20	11.50	11.50	15.00	11.00	9.75	11.40	10.60	11.00	10.60	10.70
Texas	12.02	10.52	8.62	7.79	6.80	10.62	8.60	8.20	8.12	8.12	8.50	10.75	8.25	8.25	9.20	9.80	9.60	11.10	11.90
Oklahoma	......	......	7.88	5.60	4.26	7.00	5.26	5.65	4.87	4.96	5.72	6.50	5.00	5.00	5.60	5.80	5.30	6.30	7.30
Arkansas	14.67	12.57	9.79	9.05	8.85	11.72	9.40	9.48	9.82	9.60	9.90	11.75	9.75	9.75	10.75	10.60	6.70	10.10	10.80
South Central	13.03	11.44	10.02	8.43	9.47	11.10	9.71	10.02	9.51	9.15	10.44	12.02	8.57	8.63	9.38	9.72	8.89	9.93	10.92
Montana	......	10.97	9.82	7.87	8.70	8.18	7.54	8.81	8.70	7.70	8.90	9.50	8.35	10.25	8.60	10.30	11.00	9.30	10.00
Wyoming	......	12.06	8.46	6.60	7.30	7.18	7.28	6.67	5.75	6.21	7.75	7.50	7.40	7.50	8.00	11.00	9.70	9.50	8.90
Colorado	......	15.80	8.49	7.34	7.60	9.04	9.89	7.48	6.71	8.20	9.50	9.50	8.75	10.50	12.25	15.10	11.10	9.60	10.00
New Mexico	......	14.25	10.09	9.54	9.90	10.34	11.18	11.12	11.42	10.75	10.75	11.75	9.50	9.00	11.50	12.80	11.20	10.00	11.10
Arizona	......	11.50	10.03	10.64	11.30	9.18	12.23	10.34	14.84	12.37	12.00	14.00	12.20	12.75	13.80	15.00	11.90	11.80	12.80
Utah	......	6.27	6.67	6.49	7.95	8.45	7.32	6.84	6.31	6.67	7.50	7.00	7.40	8.00	9.30	14.00	8.00	8.70	9.00
Nevada	20.58	12.40	8.27	7.52	7.70	7.92	9.05	9.97	7.60	8.50	8.00	10.00	8.80	10.00	10.60	13.70	11.60	10.80	10.50
[illegible]o	......	10.75	7.30	5.80	6.50	5.91	5.50	6.86	6.08	5.90	8.00	8.50	7.10	8.00	8.50	10.20	7.50	8.60	9.10
Washington	......	11.00	9.04	9.33	9.50	8.52	8.93	12.77	11.34	9.67	11.00	15.00	11.00	12.75	13.00	13.40	13.00	12.30	14.00
Oregon	12.90	11.22	8.49	7.80	6.80	7.16	7.48	10.18	10.18	7.74	7.85	10.25	9.30	10.25	11.40	11.60	10.50	11.20	11.70
California	16.25	12.14	9.56	9.52	8.15	7.92	9.41	11.66	10.41	10.05	11.25	12.50	13.25	13.50	16.25	13.50	11.70	11.40	11.50
Far Western	16.09	11.78	8.91	8.09	7.82	8.02	8.30	9.03	8.26	8.15	9.10	10.24	9.05	10.12	11.02	12.68	10.35	9.99	10.51
United States	11.56	9.21	8.40	8.07	8.89	10.01	9.06	9.08	8.72	8.52	10.37	11.68	8.98	9.27	9.65	10.70	9.74	10.03	10.62

HAY—Continued.

Wholesale prices of hay (baled) per ton, 1896–1909.

Date.	Chicago.		Cincinnati.		St. Louis.		New York.	
	No. 1 timothy.		No. 1 timothy.		No. 1 timothy.[a]		No. 1 timothy.[b]	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1896	$8.00	$12.50	$9.00	$15.00	$9.00	$15.50	$0.75	$1.05
1897	7.50	9.00	8.00	11.50	8.50	14.00	.72½	.90
1898	7.50	10.50	7.50	10.25	7.00	12.50	.65	.80
1899	7.50	13.00	7.75	13.00	8.00	12.00	.65	.95
1900	10.00	14.00	11.50	15.00	9.75	14.50	.87½	.97½
1901	11.50	15.00	11.50	15.50	11.50	17.50	.87½	1.00
1902	10.00	17.50	11.00	16.50	9.50	16.00	17.00	22.00
1903	10.00	15.00	11.50	19.50	9.50	25.00	16.00	26.00
1904	9.00	15.00	11.00	15.50	10.00	13.50	15.00	19.00
1905	10.00	12.50	10.00	13.50	9.00	15.50	14.00	19.00
1906.								
January	10.00	11.00	12.00	13.00	12.00	14.00	16.00	17.00
February	9.50	10.50	11.00	12.50	11.50	14.00	15.00	16.50
March	9.80	12.00	12.50	13.50	12.00	15.00	15.50	16.00
April	10.00	12.50	13.50	14.75	13.50	17.00	15.50	19.20
May	11.50	12.50	14.50	16.25	14.50	18.00	17.50	19.50
June	11.50	13.00	15.00	16.00	14.00	17.00	18.00	19.00
July	12.00	16.00	15.50	18.00	11.00	17.50	18.00	20.00
August	13.00	16.00	15.25	16.00	12.00	16.50	18.00	20.00
September	13.50	16.00	15.00	16.25	13.50	15.50	17.50	19.00
October	13.50	15.50	16.00	18.25	14.50	16.50	17.50	21.00
November	15.00	17.00	17.75	19.00	15.00	18.50	19.00	23.00
December	15.50	18.00	19.00	19.50	17.50	20.00	20.00	22.00
Year	9.50	18.00	11.00	19.50	11.00	20.00	15.00	23.00
1907.							Per 100 pounds.	
January	14.50	16.50	18.00	19.50	17.00	19.00	1.05	1.10
February	*15.00*	*17.00*	*18.00*	*19.00*	*16.50*	*19.00*	*1.05*	*1.10*
March	15.00	17.00	18.50	19.50	16.75	19.00	1.10	1.20
April	15.00	18.00	19.00	20.50	16.50	18.50	1.10	1.20
May	15.50	20.50	19.75	22.75	17.00	20.50	1.15	1.25
June	18.50	21.50	20.00	22.00	18.00	21.50	1.15	1.25
July	17.50	19.00	17.00	21.75	18.00	21.00	1.10	1.20
August	18.00	19.50	14.00	18.50	15.00	24.00	1.15	1.20
September	15.00	19.50	14.50	17.50	15.00	22.00	1.00	1.20
October	14.50	19.00	16.00	17.75	14.00	19.50	1.00	1.15
November	14.50	17.00	14.50	16.75	14.50	18.25	1.05	1.10
December	13.00	17.50	15.00	16.50	14.00	18.00	1.00	1.10
Year	13.00	21.50	14.00	22.75	14.00	24.00	1.00	1.25
1908.							Per ton.	
January	12.50	13.50	14.25	16.50	13.00	18.00	20.00	21.00
February	13.00	13.50	13.75	15.25	13.00	16.50	18.00	20.00
March	12.00	13.50	13.50	15.75	13.00	16.50	19.00	21.00
April	13.00	14.00	13.75	15.00	13.00	16.50	17.00	19.00
May	13.00	14.00	13.00	14.25	14.00	17.00	18.00	19.50
June	10.00	11.00	11.50	12.75	10.50	16.00	16.00	18.00
July	10.00	10.50	12.50	14.00	10.50	16.00	15.00	17.00
August	10.00	11.00	11.50	12.75	10.00	16.00	16.50	18.00
September	10.00	10.50	11.75	13.00	12.00	15.00	14.00	17.00
October	10.00	11.50	12.50	13.50	11.50	13.50	15.00	17.00
November	11.50	12.50	12.50	13.00	11.00	14.50	16.00	16.50
December	11.50	12.00	12.50	14.00	10.50	14.00	17.00	18.00
Year	10.00	14.00	11.50	16.50	10.00	18.00	14.00	21.00
1909.								
January	11.00	12.00	13.25	13.75	12.00	14.00	16.00	17.50
February	11.00	12.00	12.75	13.25	12.00	15.00	16.00	16.50
March	*11.00*	*12.00*	12.00	*13.75*	*12.00*	15.50	16.00	*16.50*
April	12.00	13.00	13.50	15.50	12.00	17.00	15.50	17.50
May	12.00	13.00	14.50	16.00	14.50	18.50	17.00	19.00
June	13.00	14.00	14.75	17.00	14.00	17.50	18.50	20.00
July	12.50	13.00	13.00	16.50	15.00	17.50	19.00	20.00
August	14.50	15.00	14.00	14.50	12.00	17.50	19.50	21.00
September	13.00	14.00	14.00	15.50	11.50	15.50	18.00	18.50
October	13.00	14.00	15.00	15.50	13.50	15.50	18.50	18.50
November	13.00	15.50	14.50	16.00	14.00	17.00	18.50	19.00
December	16.00	17.00	16.00	17.25	15.00	17.00	19.50	20.00
Year	11.00	17.00	12.00	17.25	11.50	18.50	15.50	21.00

[a] Choice timothy, 1896.

[b] Per hundredweight, 1896 to 1901.

CLOVER AND TIMOTHY SEED.

Wholesale prices of clover and timothy seed, 1896–1909.

Date.	Clover (bushels of 60 pounds).								Timothy.							
	Cincinnati.		Chicago.		Toledo.		Detroit.		Cincinnati.		Chicago.		Milwaukee.		St. Louis.	
	Prime.		Poor to prime a		Poor to choice b				Per bushel (of 45 pounds).		Poor to choice (per 100 pounds) b		Per 100 pounds.		Poor to prime (per 100 pounds).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1896	$2.75	$5.00	$1.20	$5.40	$4.20	$5.95	....	....	$1.15	$2.25	$1.50	$4.00	$1.90	$3.75	...	...
1897	2.75	4.50	1.20	5.55	3.10	5.32½	$3.00	$5.35	1.15	1.25	2.50	3.10	2.00	3.10	...	...
1898	2.45	3.75	.60	4.80	2.80	5.15	2.80	5.20	.95	1.25	2.15	3.00	1.50	3.00	...	...
1899	2.75	4.50	.90	5.16	3.42½	6.80	3.40	6.50	.95	1.15	2.25	2.55	1.70	2.80	...	...
1900	4.00	6.00	2.40	6.30	4.95	7.85	4.80	7.10	1.03	2.00	2.32½	4.65	1.90	4.50	...	...
1901	4.50	6.60	2.40	6.90	5.15	7.40	5.15	7.35	1.70	2.90	3.35	6.55	3.00	6.25	...	...
1902	4.11	5.76	2.40	6.81	3.90	7.10	4.90	6.10	1.98	3.96	2.00	7.35	2.50	6.75	$2.40	$6.40
1903	5.00	7.10	2.40	7.50	3.05	7.70	6.46	7.50	1.20	1.70	1.75	4.35	2.00	3.75	2.00	3.60
1904	4.80	7.50	3.60	7.80	2.50	7.95	6.20	7.95	1.15	1.35	1.75	3.25	2.00	3.15	2.00	2.80
1905	5.70	7.75	4.80	8.64	3.00	8.85	6.30	8.75	1.15	1.60	1.50	3.75	2.25	3.50	2.00	3.70
1906.																
January	6.50	7.50	6.00	7.95	5.00	8.35	8.10	8.30	1.30	1.35	2.00	3.40	2.50	3.10	2.60	2.80
February	6.50	7.50	6.00	8.49	4.00	8.72½	8.20	8.70	1.30	1.35	2.25	3.35	2.60	2.80	2.60	3.20
March	6.50	7.50	5.70	8.40	3.30	8.40	7.30	8.35	1.30	1.35	2.00	3.25	2.40	2.75	2.50	3.05
April	6.00	7.50	4.20	8.10	3.25	7.85	6.25	7.80	1.30	1.25	2.00	3.20	2.45	2.80	2.50	3.20
May	6.00	6.50	3.90	6.90	3.00	6.80	6.25	6.75	1.30	1.35	2.00	3.35	2.60	2.95	2.40	3.20
June	4.50	5.50	4.20	6.75	5.00	6.90	6.65	6.75	1.35	1.45	2.25	4.25	2.70	4.00	2.40	4.00
July	4.50	6.00	4.20	6.75	5.25	7.10	6.65	6.95	1.50	1.80	2.50	4.25	3.25	4.00	3.00	4.00
August	4.50	7.00	4.20	7.50	4.50	7.35	7.00	7.50	1.50	1.80	2.50	4.10	3.15	3.75	3.00	4.00
September	5.00	7.00	4.80	7.65	3.50	8.10	7.30	7.90	1.50	1.80	3.00	4.30	3.10	3.75	3.60	4.00
October	5.00	7.25	4.80	7.80	3.60	8.50	7.95	8.30	1.50	1.80	3.00	4.25	3.10	3.75	3.25	4.00
November	7.00	7.50	4.80	8.04	3.50	8.30	8.00	8.25	1.50	1.80	3.00	4.40	3.10	3.75	3.25	4.00
December	7.00	7.50	5.10	8.40	3.00	8.47½	8.20	8.40	1.50	1.85	3.25	4.50	3.10	4.25	3.25	4.00
Year	4.50	7.50	3.90	8.49	3.00	8.72½	6.25	8.70	1.30	1.85	2.00	4.50	2.40	4.25	2.40	4.00
1907.																
January	7.00	7.50	5.40	8.40	3.00	8.65	8.30	8.60	1.50	1.85	3.25	4.45	3.50	4.25	3.25	4.25
February	7.00	7.50	5.40	8.31	3.00	8.47½	8.00	8.45	1.50	2.00	3.15	4.55	3.50	4.35	3.50	4.45
March	7.00	7.50	5.40	9.45	3.15	9.50	8.00	9.25	1.75	2.00	3.00	4.60	3.50	4.35	3.00	4.45
April	7.00	7.50	4.80	9.30	3.10	9.35	8.45	9.25	1.75	2.00	3.00	4.35	3.40	4.15	3.60	4.00
May	7.00	7.50	4.80	9.15	3.25	9.25	8.75	9.25	1.75	2.25	3.25	4.75	3.25	4.00	3.00	4.05
June	7.00	7.50	5.10	9.15	7.25	9.35	9.00	9.00	1.75	2.00	3.50	4.75	3.75	4.50	3.00	4.00
July	7.00	7.50	5.10	9.30	3.05	9.60	9.00	9.25	1.75	2.00	3.50	4.75	3.75	4.65	3.25	4.25
August	7.50	8.50	5.10	9.75	8.00	10.00	9.00	9.50	1.75	2.15	3.50	4.65	3.50	4.65	3.25	4.50
September	7.50	8.50	5.40	10.05	6.50	10.75	9.00	10.50	1.75	2.15	3.50	4.75	3.50	4.40	3.75	4.60
October	7.50	8.50	6.00	10.20	3.00	11.00	9.50	10.75	1.75	2.15	3.50	4.00	3.80	4.40	3.50	4.50
November	7.50	8.50	5.40	9.90	3.00	9.80	9.35	9.50	1.75	2.15	3.25	4.70	3.50	4.40	3.50	4.30
December	7.50	8.50	5.70	10.20	3.00	10.37½	9.50	10.25	1.75	2.15	3.00	4.35	3.50	4.25	3.50	4.20
Year	7.00	8.50	4.80	10.20	3.00	11.00	8.00	10.75	1.50	2.25	3.00	4.75	3.25	4.65	3.00	4.60
1908.																
January	7.50	10.00	6.00	11.25	6.25	11.40	10.25	11.20	1.75	2.15	4.35	4.55	3.75	4.40	3.50	4.50
February	7.50	10.00	7.20	11.76	6.65	11.77½	11.20	11.60	1.75	2.15	4.60	4.85	3.75	4.60	3.75	4.50
March	7.50	11.00	7.35	13.05	8.50	13.35	11.40	13.00	1.75	2.15	4.50	4.85	3.50	4.30	3.65	4.25
April	8.00	11.00	4.80	14.40	7.00	13.55	11.50	13.00	1.75	2.05	4.25	4.65	2.75	4.10	3.00	4.00
May	8.00	11.00	4.80	10.20	5.50	13.25	12.00	12.50	1.75	2.05	4.10	4.25	2.75	4.00	3.00	3.75
June	8.00	11.00	4.80	10.20	6.00	13.00	.....	.....	1.75	2.05	3.80	4.00	3.00	4.00	3.00	3.75
July	8.00	11.00	4.80	10.20	6.00	13.00	.....	.....	1.75	2.05	3.92½	4.10	3.25	4.00	3.00	3.50
August	5.50	6.00	4.20	10.20	5.20	13.00	.....	.....	1.65	2.05	3.60	3.80	2.85	3.75	3.00	4.00
September	4.50	5.50	4.50	6.00	4.75	5.95	5.50	5.60	1.50	1.65	3.25	3.75	2.50	3.50	2.00	3.50
October	4.00	5.50	3.60	5.70	3.90	5.60	4.60	5.60	1.35	1.65	3.40	3.75	2.50	3.25	2.25	3.35
November	4.00	5.00	3.60	5.70	4.00	5.65	5.00	5.60	1.35	1.55	3.75	4.00	2.50	3.50	2.50	3.35
December	4.00	5.00	3.90	5.67	4.40	5.72½	5.45	5.65	1.35	1.55	3.70	3.85	2.75	3.65	2.50	3.45
Year	4.00	11.00	3.60	14.40	3.90	13.55	4.60	13.00	1.35	2.15	3.25	4.85	2.50	4.60	2.00	4.50

a Poor to choice, 1896 to 1904.

b Prime, 1902 to 1904.

CLOVER AND TIMOTHY SEED—Continued.

Wholesale prices of clover and timothy seed, 1896–1909—Continued.

Date.	Clover (bushels of 60 pounds).								Timothy.							
	Cincinnati.		Chicago.		Toledo.		Detroit.		Cincinnati.		Chicago.		Milwaukee.		St. Louis.	
	Prime.		Poor to *prime*.		Poor to *choice*.				Per bushel (*of 45* pounds).		Poor to choice (*per 100* pounds).		Per 100 *pounds*.		Poor to prime (*per 100* pounds).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1909.																
January	$4.00	$5.40	$4.20	$5.61	$5.45	$5.70	....	....	$1.35	$1.55	$2.50	$4.00	$2.75	$3.65	$3.00	$3.45
February	5.00	5.40	4.50	5.58	5.35	5.60	....	....	1.35	1.55	2.50	3.90	2.75	3.75	3.00	3.45
March	5.00	5.40	4.20	5.46	5.17½	5.60	....	....	1.35	1.55	2.50	3.85	2.60	3.80	2.50	3.52
April	5.00	5.40	4.20	5.85	5.55	6.10	....	....	1.35	1.55	2.50	3.80	2.50	3.80	2.25	3.52
May	5.00	5.40	4.35	5.82	5.70	5.95	....	....	1.35	1.55	2.50	4.00	2.50	3.75	1.50	3.50
June	5.00	5.40	4.35	6.36	6.00	6.65	....	....	1.35	1.55	2.50	3.90	2.50	3.75	2.75	3.25
July	5.00	5.40	4.62	6.51	6.50	6.75	....	....	1.35	1.55	2.50	3.90	2.50	3.75	2.75	3.25
August	5.00	6.00	4.20	7.02	6.70	7.25	....	....	1.35	1.55	2.50	3.80	2.50	3.50	2.50	3.70
September	5.80	8.25	4.95	8.25	7.10	9.55	....	....	1.35	1.65	2.50	4.00	2.50	3.50	2.50	3.55
October	8.00	8.50	5.40	9.00	8.80	9.35	....	....	1.40	1.65	2.50	4.00	2.50	3.75	2.50	3.60
November	8.00	8.50	5.40	8.70	8.52½	8.95	....	....	1.30	1.55	2.50	3.75	2.50	3.75	2.50	3.50
December	8.00	8.50	5.70	8.55	8.70	9.22½	....	....	1.30	1.55	2.50	3.75	2.90	3.60	2.50	3.50
Year	4.00	8.50	4.20	9.00	5.17½	9.55	....	....	1.30	1.65	2.50	4.00	2.50	3.80	1.50	3.70

COTTON.

Cotton crop of countries named, 1904–1908.

[*No statistics for Siam and some other less important cotton-growing countries. Bales of 500 pounds, gross weight, or 478 pounds, net.*]

Country	1904.	1905.	1906.	1907.	1908.
NORTH AMERICA.					
United States:	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Contiguous [a]	13,438,012	10,575,017	13,273,809	11,107,179	13,241,799
Noncontiguous—*Porto Rico* [b]	1,076	1,881	230	466	417
Total United States (except Philippine Islands)	13,439,088	10,576,898	13,274,039	11,107,645	13,242,216
Guatemala [c]	147	147	147	147	147
Mexico	253,271	227,134	170,000	70,000	140,000
Nicaragua [b]	507	800	12	[d] 12	[d] 12
Salvador [b]	[e] 2	2	[e] 2	.....	([f])
West Indies:					
British					
Bahamas [b]	18	14	27	18	27
Barbados	402	720	1,011	[b] 1,981	[b] 2,061
Grenada [b]	658	445	651	607	489
Jamaica [b]	30	184	40	13	43
Leeward Islands	[b] 243	[b] 822	[b] 986	1,954	1,057
St. Lucia [b]	5	3	2	.....	.....
St. Vincent [b]	264	289	550	895	880
Trinidad and Tobago	33	[b] 31	23	24	28
Cuba [b]	61	21	1	.....	([f])
French—					
Guadeloupe [b]	1	5	13	10	25
Martinique [b]	12	2	1	.....	([f])
Haiti [b]	6,312	6,878	8,086	7,092	[g] 7,092
Total North America	13,701,054	10,814,395	13,455,591	11,190,398	13,394,077
SOUTH AMERICA.					
Argentina	[b] 142	[b] 495	[h] 2,000	[h] 2,000	[i] 2,000
Brazil [j]	220,000	270,000	305,000	348,000	231,000
British Guiana [b]	4	2	1	([k])	.....
Chile [b]	634	1,335	1,357	1,134	979
Colombia and Venezuela [l]	5,000	5,000	5,000	5,000	5,000
Ecuador [b]	22	47	[e] 47	[e] 47	[e] 47
Peru	45,672	49,190	58,283	66,804	[m] 66,804
Paraguay [l]	200	200	200	200	200
Total South America	271,674	326,269	431,888	423,185	306,030
EUROPE.					
Bulgaria	772	864	874	604	691
Crete [l]	700	700	700	700	700
Greece	[l] 8,200	[l] 8,200	10,147	[l] 8,200	[l] 8,200
Italy [l]	2,700	2,700	2,700	2,700	2,700
Malta	345	340	348	443	364
Turkey	[h] 6,000	[h] 7,000	[n] 7,000	[h] 14,000	[n] 7,000
Total Europe	18,717	19,804	21,769	26,647	19,655
ASIA.					
British India, including native States [o]	3,727,000	3,921,000	4,487,000	3,591,000	3,697,000
Ceylon [b]	371	324	559	664	492
China [l]	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Cyprus	1,118	1,637	3,361	4,110	1,070
Dutch East Indies [b]	15,367	13,280	15,944	19,652	[p] 19,652
French India [b]	[n] 14	14	.....	.....	.....
French Indo-China [b]	15,255	18,103	11,082	15,877	20,968
Japan	16,262	12,370	9,239	8,214	[m] 8,214
Korea [l]	70,000	70,000	70,000	70,000	70,000

[a] "Linters," a by-product obtained in the oil mills, not included. Quantity of linters produced as follows: 241,942 in 1904, 229,539 in 1905, 321,689 in 1906, 268,282 in 1907, and 345,507 in 1908.

[b] Exports.

[c] Official estimate for 1903.

[d] Exports, 1906.

[e] Exports, 1905.

[f] No data.

[g] Exports, 1907.

[h] Unofficial estimate.

[i] Estimate based on census returns of acreage.

[j] Exports and mill consumption.

[k] Less than one-half bale.

[l] Average production as unofficially estimated.

[m] Data for 1907.

[n] Data for 1905.

[o] Net exports and consumption.

[p] Exports, 1907.

COTTON—Continued.

Cotton crop of countries named, 1904–1908—Continued.

Country.	1904.	1905.	1906.	1907.	1908.
ASIA—continued.	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Persia [a]	71,509	81,931	91,431	89,689	[b] 89,689
Philippine Islands [c]	6,098	6,098	6,098	6,098	6,098
Russia, Asiatic:					
Central Asia	455,000	486,000	627,063	486,192	537,872
Transcaucasia	49,000	53,000	60,440	62,553	58,076
Total Asiatic Russia	504,000	539,000	687,503	548,745	595,948
Turkey, Asiatic	[d] 60,000	[d] 60,000	[d] 60,000	[e] 94,000	[e] 92,000
Total Asia	5,686,994	5,923,757	6,642,217	5,648,049	6,101,129
AFRICA.					
British Africa:					
Nyasaland Protectorate [a]	597	1,625	1,101	844	1,582
East Africa	609	206	214	167	526
Gambia [a]	125	5	...	...	...
Gold Coast [a]	121	61	194	117	108
Natal	3	[e] 31	42	[a] 40	[f] 82
Nigeria—					
Colony of Lagos [a]	1,805	2,675	5,640 (Colony of Lagos and Southern Protectorate)	8,556 (Nigeria, total)	4,798 (Nigeria, total)
Southern, Protectorate [a]	598	201			
Northern, Protectorate [a]	601	258	745	...	
Sierra Leone [a]	59	144	184	27	1
Uganda [a]	45	201	819	4,024	2,401
Total British Africa	4,563	5,409	8,939	13,775	9,498
Egypt	1,305,014	1,230,641	1,427,774	1,486,387	1,387,043
French Africa: [a]					
Algeria	...	...	8	73	[b] 73
Dahomey	289	[e] 84	...	428	341
Madagascar	8	11	333	1	[b] 1
Senegal	8	5	97	110	[b] 110
Somali Coast	41	106	9	7	[b] 7
Total French Africa	346	206	447	619	532
German Africa: [a]					
East Africa	872	871	870	1,068	1,191
Kamerun	...	...	2	...	11
Togo	499	618	892	1,297	1,933
Total German Africa	1,371	1,489	1,764	2,365	3,135
Italian Africa—Eritrea	43	62	[g] 62	[g] 62	[g] 62
Belgian Kongo [a]	...	1	1	3	1
Portuguese Africa—					
Angola [h]	179	492	256	425	[e] 425
East Africa	...	26	[g] 26	[a] 6	...
Total Portuguese Africa	179	518	282	431	425
Sudan (Anglo-Egyptian)	15,097	19,441	17,782	[e] 26,000	[b] 26,000
Total Africa	1,326,613	1,257,767	1,457,051	1,529,642	1,426,696
OCEANIA.					
British—Queensland	18	79	54	76	82
French: [a]					
New Caledonia	1	([i])	...	...	...
Tahiti	48	39	110	109	70
German—Bismarck Archipelago [a]	56	15	38	5	[b] 5
Total Oceania	123	133	202	190	157
Grand total	21,005,175	18,342,125	22,008,718	18,818,111	21,247,744

[a] Exports.
[b] Data for 1907.
[c] Census, 1902.
[d] Average production as unofficially estimated.
[e] Unofficial estimate.
[f] Exports from British South Africa.
[g] Data for 1905.
[h] Imports from Angola into Portugal.
[i] Less than one-half bale.

COTTON—Continued.

Cotton acreage (harvested), by States, 1904–1909.

[As reported by Bureau of Statistics, Department of Agriculture.]

State or Territory.	1904.	1905.	1906.	1907.	1908.	1909 *a*
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Virginia	47,199	38,664	36,000	35,000	28,000	25,000
North Carolina	1,306,968	1,085,568	1,374,000	1,408,000	1,458,000	1,410,000
South Carolina	2,531,875	2,161,923	2,389,000	2,426,000	2,545,000	2,180,000
Georgia	4,227,188	3,738,703	4,610,000	4,774,000	4,848,000	4,674,000
Florida	267,372	256,173	283,000	265,000	265,000	250,000
Alabama	3,611,731	3,500,168	3,658,000	3,430,000	3,591,000	3,436,000
Mississippi	3,632,458	3,051,265	3,408,000	3,220,000	3,395,000	3,400,000
Louisiana	1,745,865	1,561,774	1,739,000	1,622,000	1,550,000	965,000
Texas	8,355,491	6,945,501	8,894,000	9,156,000	9,316,000	9,334,000
Arkansas	2,051,185	1,718,751	2,097,000	1,959,000	2,286,000	2,209,000
Tennessee	881,341	757,397	814,000	749,000	754,000	727,000
Missouri	79,403	66,444	91,000	71,000	87,000	87,000
Oklahoma	502,021	418,184	1,080,000	2,196,000	2,311,000	2,037,000
Indian Territory	813,642	816,638	901,000			
United States	30,053,739	26,117,153	31,374,000	31,311,000	32,444,000	30,780,000

a Preliminary.

Production of lint cotton (excluding linters), in 500-pound gross weight bales, by States and total value of crop, 1904 to 1909.

[As finally reported by U. S. Bureau of the Census, except 1909, which are preliminary estimates of Department of Agriculture.]

State or Territory.	1904.	1905.	1906.	1907.	1908.	1909.
	Bales.	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Virginia	16,195	14,913	13,862	9,223	12,326	10,000
North Carolina	703,760	619,141	579,326	605,310	646,958	615,000
South Carolina	1,151,170	1,078,047	876,181	1,119,220	1,170,608	1,095,000
Georgia	1,887,853	1,682,555	1,592,572	1,815,834	1,931,179	1,800,000
Florida	79,171	68,797	55,945	49,794	62,089	57,000
Alabama	1,448,157	1,238,574	1,261,522	1,112,698	1,345,713	1,020,000
Mississippi	1,798,917	1,198,572	1,530,748	1,468,177	1,655,945	1,020,000
Louisiana	1,089,526	513,480	987,779	675,428	470,136	280,000
Texas	3,145,372	2,541,932	4,174,206	2,300,179	3,814,485	2,570,000
Arkansas	930,665	619,117	941,177	774,721	1,032,920	715,000
Tennessee	329,319	278,637	306,037	275,235	344,485	240,000
Missouri	51,570	42,730	54,358	36,243	61,907	49,000
Oklahoma	335,064	326,981	487,306	862,383	690,752	617,000
Indian Territory	469,254	350,125	410,520			
All other	2,019	1,416	2,270	2,734	2,296	...
United States	13,438,012	10,575,017	13,273,809	11,107,179	13,241,799	10,088,000
Total value of crop	$561,100,386	$556,833,817	$640,311,538	$613,630,436	$588,814,828	...

COTTON—Continued.

Condition of the cotton crop in the United States, monthly, and average yield per acre, 1889–1909.

Year.	June.	July.	August.	September.	October.	Average yield per acre (lint).	Year.	June.	July.	August.	September.	October.	Average yield per acre (lint).
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Lbs.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Lbs.*
1889	86.4	87.6	89.3	86.6	81.5	159.0	1900	82.5	75.8	76.0	68.2	67.0	194.0
1890	88.8	91.4	89.5	85.5	80.0	187.0	1901	81.5	81.1	77.2	71.4	61.4	169.0
1891	85.7	88.6	88.9	82.7	75.7	179.4	1902	95.1	84.7	81.9	64.0	58.3	188.5
1892	85.9	86.9	82.3	76.8	73.3	205.0	1903	74.1	77.1	79.7	81.2	65.1	174.5
1893	85.6	82.7	80.4	73.4	70.7	149.0	1904	83.0	88.0	91.6	84.1	75.8	204.9
1894	88.3	89.6	91.8	85.9	82.7	192.0	1905	77.2	77.0	74.9	72.1	71.2	186.1
1895	81.0	82.3	77.9	70.8	65.1	156.0	1906	84.6	83.3	82.9	77.3	71.6	202.5
1896	97.2	92.5	80.1	64.2	60.7	124.1	1907	70.5	72.0	75.0	72.7	67.7	178.3
1897	83.5	86.0	86.9	78.3	70.0	181.9	1908	79.7	81.2	83.0	76.1	69.7	194.9
1898	89.0	91.2	91.2	79.8	75.4	219.0	1909	81.1	74.6	71.9	63.7	58.5	156.8
1899	85.7	87.8	84.0	68.5	62.4	184.0							

Average yield per acre of cotton in the United States.

State.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909. (a)
	1866-1875.	1876-1885.	1886-1895.	1896-1905.										
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Virginia	175	169	156	173	180	176	248	180	204	204	185	190	210	192
North Carolina	171	175	171	199	199	142	236	210	233	240	201	205	211	208
South Carolina	150	152	158	186	167	141	199	178	215	220	175	215	219	210
Georgia	150	147	152	171	172	167	165	158	205	200	165	190	190	184
Florida	140	107	125	122	133	117	120	142	140	144	95	115	112	110
Alabama	149	141	150	162	151	156	144	161	182	173	165	169	179	142
Mississippi	177	175	182	200	159	205	220	211	220	190	215	228	233	157
Louisiana	208	206	211	235	234	260	262	223	265	170	272	210	145	135
Texas	236	192	198	169	226	159	148	143	183	164	225	130	196	132
Arkansas	216	221	214	206	223	173	268	196	205	172	215	195	215	155
Tennessee	170	188	165	182	177	136	252	200	202	212	180	190	218	158
Missouri	232	204	224	213	275	196	352	232	270	294	285	275	340	271
Oklahoma	......	......	150	228	301	206	257	228	248	215	217	200	143	145
United States	176.4	171.4	175.9	182.6	194.4	169.0	188.5	174.5	204.9	186.1	202.5	178.3	194.9	156.8

a Preliminary.

Average farm price of cotton per pound, monthly, 1908–9.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	8.4	......	......	......	8.6	......	......	......	8.5	......	8.3	......	......	......
February	9.0	......	......	......	9.3	......	......	......	8.7	......	8.9	......	......	......
March	9.0	11.0	......	......	9.3	11.5	......	......	9.0	10.9	8.9	10.8	......	......
April	9.1	10.2	......	......	9.3	10.2	......	......	9.1	9.3	9.0	10.2	......	......
May	9.6	9.6	......	......	10.0	9.9	......	......	9.2	10.0	9.5	9.5	......	......
June	10.1	10.6	......	......	10.6	11.0	......	......	......	10.0	9.9	10.4	......	......
July	10.3	10.9	......	......	10.9	11.4	......	......	9.2	10.7	10.1	10.7	......	......
August	11.3	10.3	......	......	11.9	10.9	......	......	10.0	10.5	11.1	10.0	......	......
September	11.7	9.4	......	......	12.0	9.6	......	......	......	9.0	11.6	9.2	......	......
October	12.6	9.0	......	......	12.7	9.1	......	......	11.9	8.9	12.5	8.9	......	......
November	13.7	8.7	......	......	14.0	9.0	......	......	12.9	8.8	13.6	8.6	......	......
December	13.9	8.7	......	......	14.1	8.8	......	......	13.5	9.0	13.8	8.6	......	......

COTTON—Continued

Closing prices of middling Upland cotton per pound, 1895–1909.

Date.	New York.		New Orleans.		Memphis.		Galveston.		Savannah.		Charleston.		Wilmington.		Norfolk.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1896	7 1/16	8 3/8	6 1/4	8 1/8	6 5/8	8 1/16	6 3/8	8 1/4	6 3/8	7 13/16	5 3/4	8	6 7/16	8	6 11/16	8 1/4
1897	5 13/16	8 1/4	5 1/4	7 13/16	5 1/4	7 13/16	5 3/8	7 13/16	5 1/8	7 1/4	5 1/4	7 1/2	5	8 1/4	5 3/8	8 1/4
1898	5 5/16	6 5/8	4 3/4	6 1/16	4 1/4	6	4 1/8	6 1/16	4 1/4	6	4 9/16	6	4 3/4	6 1/4	4 13/16	6 3/8
1899	6 1/8	7 13/16	5 1/16	7 1/2	5 3/8	7 1/2	5 7/16	7 1/2	5 1/16	7 5/16	5 1/4	7 1/2	5 3/8	7 1/4	5 1/4	7 1/2
1900	7 1/4	11	7 1/4	11 1/8	7 3/8	11	7 1/4	10	7 5/16	10 1/4	7 1/4	10 1/4	7 3/8	10 1/4	7 5/16	11
1901	7	12	7 1/4	9 13/16	7 1/8	9 3/8	7 3/8	9 13/16	7 1/8	9 5/8	7 1/8	9 3/8	7 1/4	9 1/4	7 1/4	9 13/16
1902	8 1/16	9 7/8	7 5/8	9 3/4	7	9 3/8	7 1/4	9 5/8	7 9/16	9 5/16	7 5/16	9 3/8	7 1/4	9 3/8	7 3/4	9 3/4
1903	8.85	14.10	8 7/16	13 5/8	8 1/4	13 1/2	8 5/8	13 3/8	8 3/8	13 3/8	8 1/4	13 1/2	8 1/4	12 3/4	8 3/8	13 3/4
1904	6.85	17.25	6 1/4	16 7/16	6 3/4	16 1/8	6 3/8	16	6 1/4	16 1/4	6 1/4	16	9	15 3/4	6 3/4	16 1/4
1905	7.00	12.60	6 5/8	12 1/16	6 3/4	12 1/8	6 3/4	12	6 3/8	11 13/16	6 3/8	11 5/16	6 1/4	11 3/4	6 3/4	12
1906.																
Jan	11.35	12.25	11 1/4	11 11/16	11 1/2	11 13/16	11	11 3/16	10 5/8	11 7/16	11	11 3/8	11	11 1/4	11 1/4	11 3/4
Feb	10.80	11.45	10 3/4	10 15/16	10 3/4	11 3/16	10 3/4	11	10 3/8	10 15/16	10 1/4	10 11/16	10 1/4	10 1/2	10 3/4	11
Mar	10.95	11.80	10 5/8	11 1/16	10 3/4	11 1/4	10 3/4	11 5/16	10 3/8	11 1/8	10 5/8	11	10 1/4	11	10 1/2	11 3/16
Apr	11.55	11.90	11 1/8	11 7/16	11 1/8	11 5/16	11 1/4	11 7/16	11	11 5/16	10 5/8	11 1/8	11	11 1/4	11 1/4	11 5/8
May	11.25	12.00	11 1/8	11 7/16	11 1/4	11 7/16	11 1/8	11 9/16	11	11 5/16	11	11 5/16	11	11 5/16	11 1/2	11 7/16
June	10.80	11.30	10 7/8	11 1/16	10 3/4	11	11 1/8	11 1/16	10 3/4	11 1/4	10 5/8	10 9/16	10 3/4	10 13/16	11	11 1/4
July	10.80	11.00	10 7/8	11 1/8	10 3/4	11	10 7/8	11 5/16	10 3/4	10 13/16	....	....	10 3/4	10 3/4	11	11 5/16
Aug	9.80	10.90	9 5/8	10 3/16	9 5/8	10 3/4	9 1/4	10 5/16	9 3/4	10 1/4	9	9 1/4	9	10 5/16	9 3/4	11 1/16
Sept	9.60	10.00	9 3/4	9 5/16	9 3/8	9 9/16	9 1/2	9 13/16	8 3/4	9 5/16	8 3/4	9 1/2	9	9 5/16	9 3/4	9 7/16
Oct	10.25	11.40	9 13/16	11 7/16	10 1/16	11 1/2	9 5/8	11 5/16	9 5/8	10 15/16	9 3/8	11	9 1/2	11	9 13/16	11 5/16
Nov	10.10	11.40	9 5/8	11 3/16	9 5/8	11	9 7/8	11 5/16	9 3/8	10 13/16	9 1/4	10 3/8	9 3/8	10 9/16	10	11 1/4
Dec	10.45	11.25	10 1/8	11 3/8	10 1/4	11 1/16	10 1/4	11 1/8	9 3/4	10 7/16	9 1/2	10 7/16	9 5/8	10 5/8	10 1/4	11 1/4
Year	9.60	12.25	9 3/8	11 11/16	9 3/8	11 11/16	9 1/4	11 9/16	8 3/4	11 3/4	8 3/4	11 5/8	9	11 1/4	9 3/8	11 3/4
1907.																
Jan	10.70	11.00	10 1/4	10 9/16	10 1/4	10 9/16	10 1/2	10 15/16	9 3/4	10 7/16	9 1/4	10	9 7/8	10 5/16	10 1/4	10 5/8
Feb	11.00	11.25	10 3/4	10 9/16	10 7/16	10 9/16	10 3/4	11 1/16	10 1/8	10 5/16	10	10 5/16	10 1/8	10 5/8	10 1/2	10 7/8
Mar	10.90	11.45	10 5/8	11 1/16	10 3/8	10 15/16	10 13/16	11 7/16	10 3/8	10 5/8	10 3/8	10 3/8	10 3/8	10 5/8	11	11 1/4
Apr	10.90	11.45	10 1/2	11 3/16	10 1/2	11 1/8	10 7/8	11 5/8	10 1/4	11	10 1/4	10 1/2	10 3/8	10 7/8	11	11 1/4
May	11.50	12.90	11 1/2	12 1/16	11 1/2	12 1/4	11 7/8	12 1/4	11	12 1/8	11	11 1/4	11	12 1/4	12	13 1/4
June	12.80	13.25	12 1/2	13	12 1/4	12 15/16	12 3/4	13 1/16	12 1/4	12 3/4	....	....	12 1/4	12 1/4	13 1/4	13 1/4
July	12.85	13.50	12 5/8	13 1/8	12 15/16	13 3/16	12 7/8	13 1/8	12 1/2	13 1/8	....	....	....	....	13 1/4	13 3/4
Aug	13.00	13.55	12 5/8	13 9/16	13	13 1/2	....	....	12 3/4	13 7/16	....	....	....	....	13 1/4	13 3/4
Sept	11.75	13.55	11 1/4	12 9/16	11 3/8	13 1/2	12 1/8	13 9/16	11 1/4	13 5/16	11 1/8	13	11 1/4	13	11 3/4	13 1/4
Oct	10.80	12.00	10 3/4	11 7/16	10 3/4	12	11	12 1/4	10	11 5/16	10	11 3/16	10	11 5/16	10 5/8	11 3/4
Nov	10.60	11.80	10 1/2	11 5/16	10 3/4	11 1/4	10 7/8	11 3/16	10 1/4	10 7/16	10 1/8	10 7/16	10 1/4	10 7/16	10 1/2	11 1/4
Dec	11.70	12.20	11 1/8	11 13/16	11 3/8	11 3/4	11 1/2	12	10 1/2	11 7/16	10 3/4	11 5/16	10 13/16	11 3/16	11 1/4	11 9/16
Year	10.60	13.55	10 1/4	13 5/16	10 1/4	13 1/2	10 1/2	13 9/16	9 7/8	13 5/16	9 1/4	13	9 5/8	13	10 1/4	13 3/4
1908.																
Jan	11.30	12.25	11 3/8	12 1/4	11 1/2	12 3/8	11 3/8	12 1/4	10 9/16	11 5/8	10 5/8	11 1/2	10 13/16	11 3/4	11 1/4	12 1/2
Feb	11.35	11.85	11 3/8	11 1/4	11 3/8	11 13/16	11 3/8	11 1/8	11	11 3/8	11	11 1/2	11 1/2	11 1/2	11 3/8	12 1/4
Mar	10.40	11.65	10 1/2	11 3/8	10 3/4	11 3/8	10 1/2	11 1/16	10 1/4	11 1/8	10	11	10 1/2	11 1/4	10 3/8	11 1/4
Apr	9.90	10.50	9 13/16	10 1/2	9 3/4	10 3/4	9 3/4	10 1/4	9 3/4	10 1/8	11	11	9 3/4	10 1/8	10 1/4	10 3/4
May	10.20	11.50	9 15/16	11 1/2	10	11 3/8	10 3/8	11 3/4	9 3/4	11 1/4	9 3/4	11 1/4	9 3/4	11 1/2	10	11 3/4
June	11.30	12.20	11 3/8	11 3/4	11 1/4	11 3/4	11 5/16	11 3/4	11 1/8	11 3/8	11	11 3/8	11 1/8	11 3/4	11 1/2	12
July	10.70	11.50	10 7/8	11 3/8	10 1/2	11 3/8	10 1/4	11 3/8	10 3/8	11 1/8	10 3/8	11	10 5/8	11 1/8	11	12
Aug	9.50	10.85	9 1/8	10 3/8	9 3/8	10 1/2	9 1/8	10 7/16	9	10 1/2	9	10 1/2	Nominal.		10	11
Sept	9.30	9.60	9	9 5/16	9 1/8	9 3/8	9 3/16	9 1/16	8 3/4	9 1/8	8 3/4	9	8 3/8	9 5/16	9 1/8	9 3/8
Oct	9.00	9.45	8 3/4	9	8 5/8	9 1/8	9	9 1/16	8 3/4	8 13/16	8 3/4	8 13/16	8 3/4	8 5/8	8 3/4	9 3/8
Nov	9.25	9.55	8 7/8	9 1/16	9 1/8	9 1/4	9	9 3/16	8 3/4	9	8 3/4	8 13/16	8 3/4	8 5/8	9	9 1/16
Dec	9.10	9.35	8 11/16	8 15/16	8 3/4	9 1/8	8 3/4	9	8 1/4	8 15/16	8 1/4	8 3/4	8 1/2	8 15/16	8 3/4	9 1/16
Year	9.00	12.25	8 11/16	12 1/4	8 3/4	12 3/8	8 3/4	12 1/4	8 1/4	11 5/8	8 1/4	11 5/8	8 1/4	11 3/4	8 3/4	12 1/4
1909.																
Jan	9.25	10.00	8 7/8	9 5/8	9	9 1/2	9	9 7/8	8 11/16	9 9/16	8 3/4	9 5/16	9	9 1/2	....	....
Feb	9.65	10.00	9 5/16	9 1/2	9 5/16	9 3/8	9 7/16	9 3/4	9 3/16	9 7/16	9	9 5/16	9	9 3/8	....	....
Mar	9.60	9.85	9 1/4	9 1/2	9 5/16	9 7/16	9 3/8	9 5/16	9 3/16	9 5/16	9	9 5/16	9	9 3/8	....	....
Apr	9.95	10.90	9 7/16	10 5/16	9 3/4	10 1/4	9 9/16	10 3/8	9 5/16	10 1/16	9 1/4	10 1/16	9 3/8	10 1/4	....	....
May	10.85	11.80	10 5/16	11	10 5/16	10 7/8	10 3/8	10 7/8	10 3/16	10 7/8	10	10 15/16	10 1/8	10 7/8	....	....
June	11.20	12.00	10 7/8	11 1/8	10 7/8	11 3/8	10 3/8	11 1/4	10 3/4	11 3/8	....	....	10 3/4	11 1/4	....	....
July	12.10	13.15	11 1/2	12 3/8	11 7/16	12 3/8	11 5/8	12 1/2	11 1/8	12 3/8	....	....	11 1/4	12 3/16	....	....
Aug	12.40	13.10	12 1/8	12 1/2	12	12 3/8	12	12 3/8	12	12 1/2	....	....	12 3/8	12 1/4	....	....
Sept	12.40	13.75	12 3/16	13 3/16	12 3/8	13 1/4	12 5/16	13 3/16	12	13 1/16	11 7/8	13	12 1/8	13	....	....
Oct	13.30	15.05	13	14 7/16	13 1/4	14 3/4	13	14 7/16	12 3/4	14 3/8	12 1/4	14 1/16	13	14 1/4	....	....
Nov	14.20	15.20	14 1/8	14 15/16	14 3/8	15	13 7/8	14 5/8	13 3/4	14 5/8	14	14 5/16	13 3/4	14 1/4	....	....
Dec	14.65	16.15	14 1/4	15 3/4	14 5/8	15 5/8	14 1/4	15 3/4	14 1/8	15 5/8	14 1/2	15 5/16	14	15 5/8	....	....
Year	9.25	16.15	8 7/8	15 3/4	9	15 5/8	9	15 1/2	8 11/16	15 7/8	8 3/4	15 5/16	9	15 5/8	....	....

COTTON—Continued.

International trade in cotton, 1904–1908.[a]

[Bales of 500 pounds, gross weight, or 478 pounds of lint, net.]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Bales.	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Brazil	Jan. 1	61,170	111,069	146,060	129,308	16,442
British India	Jan. 1	1,553,948	1,628,666	1,625,261	2,214,504	1,423,637
China	Jan. 1	342,702	229,160	214,656	275,608	171,132
Egypt	Jan. 1	1,225,259	1,352,516	1,387,636	1,421,818	1,315,968
France	Jan. 1	150,462	164,814	169,840	193,357	213,791
Germany[b]	Jan. 1	189,609	158,722	181,956	269,548	248,768
Netherlands	Jan. 1	104,182	98,851	105,827	111,005	108,262
Persia	Mar. 21	71,509	81,931	91,431	89,689	[c]89,689
Peru	Jan. 1	34,741	44,098	48,174	56,910	[c]56,910
United States	Jan. 1	6,801,689	8,310,524	7,700,458	8,769,988	9,152,070
Other countries		*166,458*	*117,167*	*137,225*	*160,071*	[d]*106,801*
Total		10,701,729	12,297,518	11,807,624	13,692,706	12,903,470

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	700,062	752,110	762,887	928,097	816,141
Belgium	Jan. 1	186,228	220,252	249,285	287,095	226,183
Canada	Jan. 1	115,389	126,711	144,484	131,737	125,546
France	Jan. 1	967,710	1,104,700	1,124,520	1,258,161	1,294,295
Germany[b]	Jan. 1	1,836,190	1,858,054	1,895,837	2,323,684	2,189,209
Italy	Jan. 1	713,733	761,328	844,118	1,005,293	953,538
Japan	Jan. 1	733,849	1,184,213	842,749	1,139,993	890,132
Mexico	Jan. 1	59,670	61,384	15,670	3,820	7,611
Netherlands	Jan. 1	203,091	210,026	208,638	245,315	243,184
Russia	Jan. 1	908,232	791,248	757,035	821,027	[d]1,096,907
Spain	Jan. 1	325,157	352,245	401,409	422,331	432,687
Sweden	Jan. 1	80,325	89,154	95,207	95,208	97,755
Switzerland	Jan. 1	113,726	110,556	109,592	118,430	107,309
United Kingdom	Jan. 1	3,559,028	4,017,610	3,686,006	4,302,404	3,702,357
United States	Jan. 1	102,629	142,982	137,415	236,293	154,662
Other countries		322,003	292,657	257,894	299,007	[d]308,399
Total		10,926,922	12,075,230	11,532,746	13,617,895	12,645,915

[a] See "General note," p. 442.
[b] Not including free ports prior to March 1, 1906.
[c] Year preceding.
[d] Preliminary.

International trade in cotton-seed oil, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
Belgium	Jan. 1	714,319	1,252,803	1,218,611	1,371,671	1,248,975
Egypt	Jan. 1	397,446	249,843	360,883	214,732	231,564
France	Jan. 1	213,087	511,743	602,856	543,110	681,400
Netherlands	Jan. 1	168,425	168,686	108,062	74,686	267,693
United Kingdom	Jan. 1	4,865,745	5,323,636	7,654,982	8,402,909	8,595,491
United States	Jan. 1	35,368,998	53,368,839	40,297,852	39,115,276	48,930,381
Other countries		1,000	38,003	4,735	4,089	[b]23,648
Total		41,729,020	60,913,553	50,247,981	49,726,473	59,979,152

[a] See "General note," p. 442.
[b] Preliminary.

COTTON—Continued.

International trade in cotton-seed oil, 1904-1908—Continued.

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
Algeria	Jan. 1	625,340	1,163,468	1,091,215	1,106,262	[a] 1,106,262
Australia	Jan. 1	105,630	178,797	54,094	70,339	133,737
Austria-Hungary	Jan. 1	4,505,589	5,499,759	5,866,528	9,391	213,448
Belgium	Jan. 1	1,591,592	3,037,814	2,098,477	2,680,250	2,201,913
Brazil	Jan. 1	840,327	759,755	947,023	1,189,127	892,480
Canada	Jan. 1	707,766	1,064,773	1,175,676	1,084,614	1,558,905
Egypt	Jan. 1	149,587	416,962	153,722	51,674	740,987
France	Jan. 1	6,130,298	11,082,265	6,859,577	8,871,580	12,314,645
Germany [b]	Jan. 1	11,347,562	16,767,840	16,293,800	15,106,019	12,617,710
Italy	Jan. 1	1,225,569	3,429,901	786,563	902,692	3,095,547
Malta	Apr. 1	285,903	235,683	224,712	192,520	[a] 192,520
Martinique	Jan. 1	277,114	300,232	301,430	289,058	[a] 289,058
Mexico	Jan. 1	4,002,908	3,960,087	3,881,825	3,809,854	4,372,063
Netherlands	Jan. 1	3,183,920	4,764,653	5,418,951	5,950,945	5,084,030
Senegal	Jan. 1	294,713	387,607	352,461	370,617	[a] 370,617
United Kingdom	Jan. 1	2,706,618	4,048,873	3,224,727	3,922,618	4,584,145
Uruguay	July 1	285,677	342,341	304,092	[c] 2,568	[a] 2,568
Other countries		699,000	792,753	3,092,742	3,670,815	[c] 4,556,917
Total		38,965,113	58,233,653	55,637,615	49,983,943	55,226,962

[a] Year preceding. [b] Not including free ports prior to March 1, 1906. [c] Preliminary.

TOBACCO.

Tobacco crop of countries named, 1904-1908.

[Production of South America (especially Brazil) largely understated, because domestic consumption is unknown. No statistics for China, Persia, Central America (except Guatemala), West Indies (except Cuba and Porto Rico), and several less important tobacco-growing countries.]

Country.	1904.	1905.	1906.	1907.	1908.
NORTH AMERICA.					
United States:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Contiguous	660,461,000	633,034,000	682,429,000	698,126,000	718,061,000
Noncontiguous—*Porto Rico* [a]	5,000,000	6,000,000	8,000,000	13,000,000	10,000,000
Total United States (except Philippine Islands)	665,461,000	639,034,000	690,429,000	711,126,000	728,061,000
Canada:					
Ontario	3,194,000	6,500,000	7,575,000	([b])	[a] 3,504,000
Quebec	[c] 5,000,000	[a] 3,100,000	[a] 3,750,000	[a] 3,000,000	[a] 7,656,000
Other	[c] 107,000	[c] 107,000	[c] 107,000	[c] 107,000	[c] 107,000
Total Canada	8,301,000	9,707,000	11,432,000	3,107,000	11,267,000
Cuba [a]	42,421,000	48,783,000	28,629,000	55,603,000	66,650,000
Guatemala	1,100,000	1,983,000	[d] 1,300,000	[d] 1,300,000	[d] 1,300,000
Mexico	28,880,000	40,574,000	[a] 22,750,000	[e] 22,750,000	[e] 22,750,000
Santo Domingo	([f])	([f])	([f])	26,400,000	[g] 16,700,000
Total	746,163,000	740,081,000	754,540,000	820,280,000	846,728,000
SOUTH AMERICA.					
Argentina	[d] 31,000,000	[h] 43,000,000	[d] 31,000,000	[d] 31,000,000	[d] 31,000,000
Bolivia [d]	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Brazil [g]	52,832,000	44,953,000	52,095,000	65,460,000	32,130,000
Chile	[d] 6,000,000	[d] 6,000,000	[d] 6,000,000	[d] 6,000,000	8,803,000
Ecuador	89,000	122,000	[i] 122,000	[i] 122,000	[i] 122,000
Paraguay	[a] 13,000,000	[d] 10,000,000	[d] 10,000,000	[d] 10,000,000	[d] 10,000,000
Peru	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Total	107,421,000	108,575,000	103,717,000	117,082,000	86,555,000

[a] Unofficial estimate.
[b] Small crop—no data.
[c] Estimated from census for 1900.
[d] Average production.
[e] Data for 1905.
[f] No data.
[g] Exports.
[h] Estimated from official data of acreage.
[i] Exports, 1905.

TOBACCO—Continued.

Tobacco crop of countries named, 1904–1908—Continued.

Country.	1904.	1905.	1906.	1907.	1908.
EUROPE.					
Austria-Hungary:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Austria	14,047,000	14,360,000	17,884,000	15,129,000	14,630,000
Hungary	88,768,000	103,076,000	160,616,000	135,013,000	[a] 135,013,000
Bosnia-Herzegovina	9,000,000	8,753,000	10,077,000	6,396,000	[a] 6,396,000
Total Austria-Hungary	111,815,000	126,189,000	188,577,000	156,538,000	156,039,000
Belgium	13,983,000	16,646,000	15,001,000	19,476,000	[a] 19,476,000
Bulgaria	9,940,000	8,638,000	14,171,000	9,016,000	[a] 9,016,000
Denmark	340,000	340,000	340,000	160,000	[a] 160,000
France	37,767,000	53,863,000	36,416,000	40,810,000	[a] 40,810,000
Germany	75,797,000	70,240,000	70,713,000	61,665,000	74,067,000
Greece	22,000,000	20,000,000	11,000,000	7,700,000	[a] 7,700,000
Italy	13,464,000	15,605,000	14,494,000	14,999,000	[b] 15,000,000
Netherlands	1,492,000	1,490,000	1,609,000	1,700,000	1,700,000
Roumania	3,999,000	8,694,000	9,994,000	15,554,000	16,099,000
Russia (including Asiatic)	204,298,000	214,050,000	162,020,000	226,258,000	207,948,000
Servia	2,379,000	2,086,000	2,381,000	2,422,000	1,732,000
Sweden	4,118,000	2,713,000	2,661,000	2,300,000	[a] 2,300,000
Turkey (including Asiatic) [b]	90,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Total Europe	591,392,000	640,554,000	629,377,000	658,598,000	652,047,000
ASIA.					
British India [b]	450,000,000	450,000,000	450,000,000	450,000,000	450,000,000
Dutch East Indies:					
Java [c]	44,991,000	65,316,000	67,088,000	81,221,000	[a] 81,221,000
Sumatra, East Coast of	45,134,000	43,635,000	47,363,000	51,460,000	[b] 42,541,000
Total Dutch East Indies	90,125,000	108,951,000	114,451,000	132,681,000	123,762,000
Japanese Empire:					
Japan	105,853,000	89,931,000	104,575,000	100,241,000	[a] 100,241,000
Formosa	222,000	187,000	[d] 187,000	[d] 187,000	[d] 187,000
Total Japanese Empire	106,075,000	90,118,000	104,762,000	100,428,000	100,428,000
Philippine Islands [e]	33,100,000	38,200,000	46,800,000	40,056,000	40,431,000
Total	679,300,000	687,269,000	716,013,000	723,165,000	714,621,000
AFRICA.					
Algeria	12,492,000	13,006,000	11,668,000	14,177,000	[a] 14,177,000
British Central Africa	60,000	326,000	1,037,000	585,000	[f] 570,000
Cape of Good Hope [e]	5,309,000	5,000,000	5,000,000	5,000,000	5,000,000
Mauritius	29,000	13,000	13,000	16,000	26,000
Natal	2,907,000	2,623,000	3,103,000	2,771,000	3,105,000
Orange River Colony	750,000	650,000	[d] 650,000	[d] 650,000	[d] 650,000
Total	21,547,000	21,618,000	21,471,000	23,199,000	23,528,000
OCEANIA.					
Australia:					
Queensland	69,000	798,000	1,146,000	723,000	274,000
New South Wales	596,000	562,000	821,000	602,000	385,000
Victoria	95,000	125,000	157,000	68,000	310,000
Total Australia	760,000	1,485,000	2,124,000	1,393,000	969,000
Fiji	58,000	1,000	[d] 1,000	44,000	38,000
Total	818,000	1,486,000	2,125,000	1,437,000	1,007,000
Grand total	2,146,641,000	2,199,583,000	2,227,243,000	2,343,767,000	2,324,486,000

[a] Year preceding.
[b] Unofficial estimate.
[c] Java reports less production than exports.
[d] Data for 1905.
[e] Estimated from returns for census year.
[f] Exports.

TOBACCO—Continued.

Acreage, production, value, etc., of tobacco in the United States, 1900–1909.

Year.	Acreage, planted and harvested.	Average yield per acre.	Production.	Average farm price per pound Dec. 1.	Farm value Dec. 1.
	Acres.	*Pounds.*	*Pounds.*	*Cents.*	*Dollars.*
1900	1,046,000	778.0	814,345,000	6.6	53,661,000
1901	1,039,000	788.0	818,953,000	7.1	58,283,000
1902	1,031,000	797.3	821,824,000	7.0	57,564,000
1903	1,038,000	786.3	815,972,000	6.8	55,515,000
1904	806,000	819.0	660,461,000	8.1	53,383,000
1905	776,000	815.6	633,034,000	8.5	53,519,000
1906	796,000	857.2	682,429,000	10.0	68,233,000
1907	821,000	850.5	698,126,000	10.2	71,411,000
1908	875,000	820.2	718,061,000	10.3	74,130,000
1909	1,180,000	804.3	949,357,000	10.1	95,719,000

Year.	Domestic exports of unmanufactured, fiscal year beginning July 1.	Imports of unmanufactured, fiscal year beginning July 1.	Condition of growing crop. July 1.	Aug. 1.	Sept. 1.	When harvested.
	Pounds	*Pounds.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1900	315,787,782	26,851,253	88.5	82.9	77.5	76.1
1901	301,007,365	29,428,837	86.5	72.1	78.2	81.5
1902	368,184,084	34,016,956	85.6	81.2	81.5	84.1
1903	311,971,831	31,162,636	85.1	82.9	83.4	82.3
1904	334,302,091	33,288,378	85.3	83.9	83.7	85.0
1905	312,227,202	41,125,970	87.4	84.1	85.1	85.8
1906	340,742,864	40,898,807	86.7	87.2	86.2	84.0
1907	330,812,658	35,005,131	81.3	82.8	82.5	84.8
1908	287,900,946	43,123,196	86.6	85.8	84.3	84.1
1909	....	....	89.8	83.4	80.2	81.3

Acreage, production, and value of tobacco in the United States in 1909.

State, Territory, or Division.	Acreage.	Production.	Farm value December 1.
	Acres.	*Pounds.*	*Dollars.*
N. Hampshire	100	170,000	25,500
Vermont	200	335,000	50,250
Massachusetts	4,400	7,040,000	985,600
Connecticut	13,400	22,110,000	3,648,150
New York	6,000	7,050,000	564,000
Pennsylvania	31,200	30,732,000	2,765,880
N. Atlantic	55,300	67,437,000	8,039,380
Maryland	25,000	17,750,000	1,473,250
Virginia	155,000	120,125,000	10,210,625
West Virginia	14,400	12,600,000	1,663,200
North Carolina	240,000	144,000,000	13,680,000
South Carolina	40,000	32,000,000	2,336,000
Georgia	2,100	1,470,000	499,800
Florida	4,500	3,195,000	1,086,300
S. Atlantic	481,000	331,140,000	30,949,175
Ohio	90,000	83,250,000	8,741,250
Indiana	20,000	19,000,000	2,090,000
Illinois	1,500	1,125,000	123,750
Wisconsin	31,500	37,170,000	3,419,040
N.C.E.Miss.R.	143,000	140,545,000	14,374,040
Missouri	5,000	4,425,000	575,250
N. C. W. Miss R.	5,000	4,425,000	575,250
Kentucky	420,000	350,700,000	37,174,200
Tennessee	73,000	53,290,000	4,156,620
Alabama	600	360,000	104,400
Mississippi	100	50,000	13,000
Louisiana	400	220,000	81,400
Texas	1,000	650,000	170,300
Arkansas	900	540,000	81,000
S. Central	496,000	405,810,000	41,780,920
United States	1,180,300	949,357,000	95,719,365

TOBACCO—Continued.

Average yield per acre of tobacco in the United States.

State.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
New Hampshire	1,151	1,514	......	1,627	1,666	1,500	1,650	1,590	1,610	1,700	1,785	1,650	1,800	1,700
Vermont	1,112	1,490	......	1,735	1,800	1,722	1,800	1,800	1,685	1,650	1,700	1,625	1,735	1,675
Massachusetts	1,379	1,497	1,597	1,695	1,823	1,810	1,560	1,400	1,690	1,850	1,750	1,525	1,650	1,600
Connecticut	1,436	1,354	1,552	1,549	1,684	1,586	1,712	1,600	1,685	1,725	1,735	1,510	1,680	1,650
New York	809	1,295	1,148	1,143	1,185	1,134	1,250	1,125	1,145	1,148	1,250	1,150	1,175	1,175
Pennsylvania	1,087	1,222	1,203	1,284	1,524	1,495	1,275	1,416	1,289	1,370	1,375	1,200	1,325	985
Maryland	626	705	579	646	527	597	625	650	621	650	600	660	700	710
Virginia	659	637	598	673	618	635	750	745	725	675	675	760	815	775
West Virginia	685	598	650	673	592	589	635	640	710	790	780	720	750	875
North Carolina	577	522	530	592	618	560	650	627	685	608	580	625	670	600
South Carolina	516	248	......	736	873	768	734	610	703	736	670	900	865	800
Georgia	537	248	......	547	495	494	670	640	650	525	675	860	975	700
Florida	603	356	......	589	546	544	520	700	815	600	875	925	990	710
Ohio	844	889	782	833	891	873	885	845	849	850	1,060	900	670	925
Indiana	711	757	666	742	773	788	835	783	691	819	915	940	700	350
Illinois	725	700	585	645	509	426	650	655	670	900	820	800	755	750
Michigan	1,050	504	......	689	600	655	765	750	675	......	......	......	......	......
Wisconsin	893	931	970	1,312	1,400	1,354	1,340	1,350	1,282	1,370	1,275	1,100	1,130	1,180
Missouri	852	815	751	689	608	459	850	698	626	778	730	825	875	885
Kentucky	688	737	736	782	810	867	800	790	827	830	870	890	815	835
Tennessee	698	660	641	664	657	717	650	700	730	768	785	800	800	730
Alabama	538	220	468	380	282	266	400	405	379	450	510	450	450	600
Mississippi	532	288	......	530	623	576	500	502	408	430	440	475	250	500
Louisiana	594	......	......	400	265	323	375	375	438	500	475	350	850	550
Texas	671	452	......	500	348	363	650	650	600	500	550	700	800	650
Arkansas	746	604	643	533	407	344	640	646	565	700	695	570	610	600
United States	711.8	736.2	721.5	759.2	778.0	788.0	797.3	786.3	819.0	815.6	857.2	850.5	820.2	804.3

Average farm value per acre of tobacco in the United States December 1.

State.	10-year averages.				1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	1866–1875.	1876–1885.	1886–1895.	1896–1905.										
	Dolls.	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*	*Dolls.*
N. Hampshire	199.00	180.10	......	247.44	249.90	225.00	264.00	206.70	241.50	289.00	303.45	198.00	252.00	255.00
Vermont	197.49	209.26	......	239.78	216.00	172.20	252.00	216.00	252.75	280.50	289.00	195.00	225.55	251.25
Massachusetts	270.85	182.71	249.27	255.88	273.45	217.20	234.00	168.00	314.34	312.65	323.75	167.75	255.75	224.00
Connecticut	297.74	172.11	243.86	272.00	252.60	237.90	273.92	248.00	380.81	293.25	312.30	173.65	285.60	272.25
New York	87.61	151.75	137.01	98.16	94.80	79.38	100.00	90.00	114.50	120.54	172.50	69.00	111.62	94.00
Pennsylvania	127.53	127.83	146.20	100.94	91.44	89.70	76.50	103.37	114.72	147.96	188.38	90.00	139.12	88.65
Maryland	49.23	46.80	36.60	36.29	31.62	35.82	37.50	35.75	40.36	39.00	40.80	42.90	52.50	58.93
Virginia	55.22	44.55	41.78	45.53	37.08	50.80	52.50	45.44	53.65	51.30	55.35	79.80	74.98	65.88
W. Virginia	73.16	50.46	62.92	52.42	41.44	47.12	44.45	39.68	60.35	67.15	71.76	72.00	105.00	115.50
N. Carolina	63.48	51.10	49.96	46.10	43.26	50.40	45.50	39.50	58.91	53.50	58.00	68.75	70.35	57.00
S. Carolina	57.05	33.54	......	55.11	61.11	53.76	51.38	31.11	57.65	64.03	70.35	96.30	86.50	58.40
Georgia	99.79	34.72	......	93.89	74.25	88.92	127.30	96.00	133.90	89.25	202.50	344.00	341.25	238.00
Florida	125.88	65.37	......	167.74	141.96	146.88	156.00	224.00	256.72	108.00	306.25	416.25	346.50	241.40
Ohio	55.92	58.97	54.93	54.79	62.37	61.11	61.95	60.84	67.92	71.40	121.90	75.60	70.35	97.12
Indiana	45.29	46.87	43.83	47.27	48.38	30.40	58.45	48.55	58.74	49.14	62.22	92.12	84.00	104.50
Illinois	53.65	46.97	44.05	37.71	35.63	29.82	45.50	39.96	36.18	54.00	57.40	80.00	64.18	82.50
Michigan	152.20	64.21	......	66.23	54.00	45.85	61.20	60.00	43.88	......	......	......	......	......
Wisconsin	91.02	99.31	85.59	89.99	98.00	108.32	93.80	91.80	100.00	137.00	172.12	71.50	113.00	108.56
Missouri	67.28	58.19	59.00	68.34	79.04	68.85	93.50	62.82	53.21	62.24	65.70	90.75	109.38	115.05
Kentucky	51.09	51.36	51.52	47.98	48.60	52.02	48.00	48.98	52.93	58.10	66.99	90.78	74.16	88.51
Tennessee	66.19	44.56	49.85	48.26	39.42	43.02	39.00	52.50	42.34	57.60	58.88	78.40	72.00	58.94
Alabama	104.67	36.32	42.11	68.24	76.14	50.54	96.00	64.80	58.74	72.00	112.20	108.00	117.00	174.00
Mississippi	107.09	43.24	......	90.61	112.14	103.68	90.00	80.32	63.65	64.50	126.72	142.50	62.50	130.00
Louisiana	123.24	......	......	92.44	60.95	90.44	75.00	75.00	94.17	125.00	130.62	98.00	272.00	203.50
Texas	134.46	81.75	......	101.00	62.64	58.08	143.00	130.00	117.00	95.00	132.00	210.00	200.00	170.30
Arkansas	100.08	52.23	68.41	66.15	48.84	44.72	76.80	77.52	67.80	98.00	83.40	76.95	91.50	90.00
U. S.	64.24	56.34	57.59	55.95	51.35	55.95	55.81	53.47	66.34	69.33	85.72	86.75	84.48	81.23

TOBACCO—Continued.

International trade in unmanufactured tobacco, 1904-1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Algeria	Jan. 1	7,524,375	6,171,178	9,722,914	7,754,758	[b]7,754,758
Austria-Hungary	Jan. 1	21,628,003	18,687,019	19,093,790	21,637,704	23,576,669
Brazil	Jan. 1	52,832,124	44,953,473	52,094,709	65,459,601	32,130,161
British India	Jan. 1	23,635,159	22,824,739	28,002,800	28,787,031	19,006,500
Bulgaria	Jan. 1	1,323,732	5,749,098	3,493,435	2,678,406	5,332,100
Ceylon	Jan. 1	4,321,624	4,617,805	4,390,497	4,425,619	4,075,120
Cuba	Jan. 1	28,191,707	32,808,058	28,568,060	19,135,347	[b]19,135,347
Dutch East Indies	Jan. 1	123,004,373	108,081,973	160,378,243	156,810,683	[c]173,306,569
Greece	Jan. 1	9,689,636	13,026,375	17,090,658	14,934,504	10,737,468
Mexico	Jan. 1	4,513,163	4,320,393	4,023,645	4,479,953	3,894,456
Netherlands	Jan. 1	4,855,896	4,003,120	4,345,341	5,163,992	3,751,654
Philippine Islands	Jan. 1	18,640,377	19,832,747	20,685,768	23,589,657	24,927,063
Russia	Jan. 1	12,810,474	15,937,120	18,317,207	14,246,861	[c]17,225,806
Santo Domingo	Jan. 1	(d)	11,675,366	15,179,810	22,947,168	16,605,594
Turkey [e]	Mar. 14	39,267,984	39,267,984	39,267,984	39,267,984	39,267,984
United States	Jan. 1	349,331,687	292,925,181	336,730,455	317,390,986	306,455,871
Other countries		4,165,963	14,230,829	9,872,908	25,094,185	[c]35,052,410
Total		706,736,277	659,113,356	777,948,332	773,813,330	742,386,131

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Argentina	Jan. 1	6,704,152	7,081,032	8,353,648	8,680,004	10,500,798
Australia	Jan. 1	6,629,793	5,871,534	7,538,320	10,169,916	12,886,746
Austria-Hungary	Jan. 1	51,898,125	50,850,488	52,856,812	36,349,587	43,528,057
Belgium	Jan. 1	24,053,826	22,141,627	21,146,214	20,158,453	20,927,037
British India	Jan. 1	4,324,751	6,512,590	5,284,295	4,993,124	6,607,386
Canada	Jan. 1	13,744,310	14,738,578	14,821,069	17,338,098	16,760,080
China	Jan. 1	7,776,400	12,116,533	16,034,533	17,770,000	11,224,933
Denmark	*Jan. 1*	*10,210,707*	*9,744,439*	*10,399,202*	*11,208,208*	*19,806,714*
Egypt	Jan. 1	16,006,292	16,501,051	18,250,013	18,801,016	19,147,819
Finland	Jan. 1	9,437,932	6,056,123	9,548,533	9,834,354	9,561,443
France	Jan. 1	57,368,125	60,966,994	54,816,081	62,557,408	63,594,945
Germany [f]	Jan. 1	143,445,274	178,936,160	131,496,120	156,098,138	170,494,442
Italy	Jan. 1	33,430,447	28,137,670	45,918,749	43,913,866	44,893,159
Netherlands	Jan. 1	50,279,873	42,252,451	46,588,181	50,172,040	47,965,176
Norway	Jan. 1	2,854,897	2,956,905	3,487,734	3,877,092	3,648,473
Portugal	Jan. 1	8,825,499	5,388,004	4,355,601	5,713,143	5,160,110
Spain	Jan. 1	55,741,625	48,907,491	30,043,202	51,055,584	31,921,214
Sweden	Jan. 1	11,714,014	7,221,852	8,361,847	9,212,130	9,165,985
Switzerland	Jan. 1	16,528,933	10,048,106	15,747,394	17,561,357	16,721,617
United Kingdom	Jan. 1	80,857,485	82,444,539	83,766,884	87,329,290	87,938,067
United States	Jan. 1	30,603,290	23,887,947	41,726,224	34,088,288	37,665,211
Other countries		30,220,653	56,276,364	55,711,151	50,720,308	[c]50,846,068
Total		672,056,403	723,428,467	686,249,816	728,212,062	741,060,459

[a] See "General note," page 442.
[b] Year preceding.
[c] Preliminary.
[d] No data.
[e] Data for 1900.
[f] Not including free ports prior to March 1, 1906.

TOBACCO—Continued.

Average farm price of tobacco per pound in the United States.

State.	Price Dec. 1, by decades.				Price Dec. 1, by years.									
	1866–1875.	1876–1885.	1886–1895.	1896–1905.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
New Hampshire	17.0	11.9	......	15.2	15.0	15.0	16.0	13.0	15.0	17.0	17.0	12.0	14.0	15.0
Vermont	17.3	14.0	......	13.9	12.0	10.0	14.0	12.0	15.0	17.0	17.0	12.0	13.0	15.0
Massachusetts	18.8	12.2	15.6	14.9	15.0	12.0	15.0	12.0	18.6	16.9	18.5	11.0	15.5	14.0
Connecticut	20.6	12.6	15.7	16.5	15.0	15.0	16.0	15.5	22.6	17.0	18.0	11.5	17.0	16.5
New York	10.7	11.5	12.0	8.7	8.0	7.0	8.0	8.0	10.0	10.5	13.8	6.0	9.5	8.0
Pennsylvania	11.2	10.6	12.0	7.6	6.0	6.0	6.0	7.3	8.9	10.8	13.7	7.5	10.5	9.0
Maryland	8.0	6.6	6.3	5.7	6.0	6.0	6.0	5.5	6.5	6.0	6.8	6.5	7.5	8.3
Virginia	8.4	7.1	7.0	6.6	6.0	8.0	7.0	6.1	7.4	7.6	8.2	10.5	9.2	8.5
West Virginia	10.7	8.5	9.8	8.2	7.0	8.0	7.0	6.2	8.5	8.5	9.2	10.0	14.0	13.2
North Carolina	11.0	10.0	9.6	7.7	7.0	9.0	7.0	6.3	8.6	8.8	10.0	11.0	10.5	9.5
South Carolina	11.2	13.5	14.8	7.5	7.0	7.0	7.0	5.1	8.2	8.7	10.5	10.7	10.0	7.3
Georgia	18.4	14.0	16.5	15.8	15.0	18.0	19.0	15.0	20.6	17.0	30.0	40.0	35.0	34.0
Florida	21.0	18.6	31.2	27.5	26.0	27.0	30.0	32.0	31.5	18.0	35.0	45.0	35.0	34.0
Ohio	6.6	6.6	7.0	7.0	7.0	7.0	7.0	7.2	8.0	8.4	11.5	8.4	10.5	10.5
Indiana	6.4	6.3	6.5	6.2	6.0	5.0	7.0	6.2	8.5	6.0	6.8	9.8	12.0	11.0
Illinois	7.2	6.7	7.6	7.0	7.0	7.0	7.0	6.1	5.4	6.0	7.0	10.0	8.5	11.0
Michigan	14.6	12.8	......	7.7	9.0	7.0	8.0	8.0	6.5	......	......	......	......	......
Wisconsin	10.4	10.6	8.5	7.4	7.0	8.0	7.0	6.8	7.8	10.0	13.5	6.5	10.0	9.2
Missouri	7.9	7.1	7.9	10.3	13.0	15.0	11.0	9.0	8.5	8.0	9.0	11.0	12.5	13.0
Kentucky	7.4	7.0	7.2	6.0	6.0	6.0	6.0	6.2	6.4	7.0	7.7	10.2	9.1	10.6
Tennessee	9.4	6.8	7.8	7.1	6.0	6.0	6.0	7.5	5.8	7.5	7.5	9.8	9.0	7.8
Alabama	19.9	16.5	14.2	18.9	27.0	19.0	24.0	16.0	15.5	16.0	22.0	24.0	26.0	29.0
Mississippi	20.4	15.0	33.0	16.3	18.0	18.0	18.0	16.0	15.6	15.0	28.8	30.0	25.0	26.0
Louisiana	21.8	......	......	22.0	23.0	28.0	20.0	20.0	21.5	25.0	27.5	28.0	32.0	37.0
Texas	20.2	17.2	......	19.4	18.0	16.0	22.0	20.0	19.5	19.0	24.0	30.0	25.0	26.2
Arkansas	13.6	8.5	10.5	12.4	12.0	13.0	12.0	12.0	12.0	14.0	12.0	13.5	15.0	15.0
United States	9.0	7.7	8.0	7.2	6.6	7.1	7.0	6.8	8.1	8.5	10.0	10.2	10.3	10.1

FLAXSEED.

Flax area of countries named, 1906–1908.

Country.	1906.	1907.	1908.
NORTH AMERICA.	*Acres.*	*Acres.*	*Acres.*
United States	2,505,900	2,864,000	2,679,000
Canada:			
Manitoba	18,800	25,900	23,400
Saskatchewan	76,000	128,500	110,000
Alberta	3,600	6,500	5,900
Total	98,400	160,900	139,300
Mexico	(a)	(a)	(a)
SOUTH AMERICA.			
Argentina	2,527,300	2,942,100	3,452,400
Uruguay	45,700	73,000	63,500
Total	2,573,000	3,015,100	3,515,900
EUROPE.			
Austria-Hungary:			
Austria	178,900	154,900	123,700
Hungary proper	29,900	30,600	27,100
Croatia-Slavonia	18,100	17,700	17,500
Bosnia-Herzegovina	(a)	(a)	(a)
Belgium	52,500	56,000	....
Bulgaria	800	400	300
France	68,000	58,900	....
Italy	(a)	(a)	(a)
Netherlands	38,200	41,600	35,600
Roumania	58,200	31,700	44,900
EUROPE—cont'd.			
Russia:			
Russia proper	3,354,600	3,370,200	3,250,900
Poland	88,600	93,800	87,500
Northern Caucasia	53,500	58,700	63,500
Total Russia (European)	3,496,700	3,522,700	3,401,900
Servia	(a)	(a)	(a)
Sweden	5,200	4,700	(a)
United Kingdom (Ireland)	55,200	59,700	46,900
ASIA.			
British India, including such native States as report	3,278,800	3,743,200	2,099,400
Russia:			
Central Asia	119,500	[b] 62,900	[b] 75,300
Siberia	103,500	104,900	111,700
Transcaucasia	21,800	(a)	(a)
Total Russia (Asiatic)	244,300	....	....
AFRICA.			
Algeria	(a)	4,300	(a)

[a] No official data.

[b] Four provinces only.

FLAXSEED—Continued.

Flax crop of countries named, 1906–1908.

Country.	Seed.			Fiber.		
	1906.	1907.	1908.	1906.	1907.	1908.
NORTH AMERICA.	*Bushels.*	*Bushels.*	*Bushels.*	*Pounds.*	*Pounds.*	*Pounds.*
United States	25,576,000	25,851,000	25,805,000			
Canada:						
Manitoba	274,000	317,000	281,000			
Saskatchewan	711,000	1,365,000	1,144,000			
Alberta	39,000	50,000	74,000			
Total	1,024,000	1,732,000	1,499,000			
Mexico	150,000	150,000	150,000			
Total North America	26,750,000	27,733,000	27,454,000			
SOUTH AMERICA.						
Argentina	23,303,000	32,502,000	43,333,000			
Uruguay	424,000	863,000	723,000			
Total	23,727,000	33,365,000	44,056,000			
EUROPE.						
Austria-Hungary:						
Austria	1,375,000	1,239,000	932,000	128,141,000	102,158,000	74,106,000
Hungary proper	248,000	260,000	190,000	23,363,000	26,018,000	19,965,000
Croatia-Slavonia	29,000	7,000	30,000	11,459,000	10,352,000	8,861,000
Bosnia-Herzegovina	4,000	4,000	4,000	1,479,000	1,400,000	1,400,000
Total Austria-Hungary	1,656,000	1,510,000	1,156,000	164,442,000	139,028,000	104,332,000
Belgium	294,000	300,000	300,000	26,843,000	27,000,000	27,000,000
Bulgaria	6,000	2,000	2,000	473,000	64,000	168,000
France	646,000	613,000	597,000	46,109,000	44,046,000	46,340,000
Italy	(a)	(a)	(a)	41,917,000	41,917,000	41,917,000
Netherlands	365,000	392,000	341,000	21,947,000	26,318,000	19,692,000
Roumania	571,000	159,000	180,000	6,978,000	5,018,000	2,404,000
Russia:						
Russia proper	17,254,000	19,176,000	17,326,000	1,358,287,000	1,583,201,000	1,500,000,000
Poland	911,000	925,000	903,000	69,524,000	70,000,000	70,000,000
Northern Caucasia	366,000	467,000	410,000	23,119,000	26,000,000	26,000,000
Total Russia (European)	18,531,000	20,568,000	18,639,000	1,450,930,000	1,679,201,000	1,596,000,000
Servia	(b)			1,543,000	1,601,000	1,032,000
Sweden	30,000	22,000	22,000	1,795,000	1,425,000	1,425,000
United Kingdom (Ireland)				26,935,000	26,089,000	17,745,000
Total	22,099,000	23,566,000	21,237,000	1,789,912,000	1,992,607,000	1,858,055,000
ASIA.						
British India, including such native States as report	14,128,000	17,008,000	6,528,000			
Russia:						
Central Asia	721,000	c 545,000	c 495,000	27,607,000	27,000,000	27,000,000
Siberia	615,000	581,000	797,000	45,371,000	47,700,000	45,785,000
Transcaucasia	108,000	150,000	150,000	8,833,000	10,000,000	10,000,000
Total Russia (Asiatic)	1,444,000	1,276,000	1,442,000	81,811,000	84,700,000	82,785,000
Total Asia	15,572,000	18,284,000	7,970,000	81,811,000	84,700,000	82,785,000
AFRICA.						
Algeria	17,000	12,000	12,000			
Grand total	88,165,000	102,960,000	100,729,000	1,871,723,000	2,077,307,000	1,940,840,000

a No official data. b No detailed official data. c Incomplete official returns.

FLAXSEED—Continued.

Acreage, production, value, etc., of flaxseed in the United States, 1902–1909.

Year.	Acreage sown and harvested.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.	Condition of growing crop.			
						July 1.	Aug. 1.	Sept. 1.	When harvested.
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dollars.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
1902...	3,740,000	7.8	29,285,000	105.0	30,815,000	......	......	......	......
1903...	3,233,000	8.4	27,301,000	81.7	22,292,000	86.2	80.3	80.5	74.0
1904...	2,264,000	10.3	23,401,000	99.3	23,229,000	86.6	78.9	85.8	87.0
1905...	2,535,000	11.2	28,478,000	84.4	24,049,000	92.7	90.7	94.2	91.5
1906...	2,506,000	10.2	25,576,000	101.3	25,899,000	93.2	92.2	89.0	87.4
1907...	2,864,000	9.0	25,851,000	95.6	24,713,000	91.2	91.9	85.4	78.0
1908...	2,679,000	9.6	25,805,000	118.4	30,577,000	92.5	86.1	82.5	81.2
1909...	2,742,000	9.4	25,856,000	152.6	39,466,000	95.1	92.7	88.9	84.9

Acreage, production, and value of flaxseed in the United States in 1909, by States.

State.	Acreage.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.
	Acres.	*Bushels.*	*Bushels.*	*Dollars.*	*Dollars.*
Wisconsin	20,000	14.5	290,000	1.35	392,000
Minnesota	450,000	10.0	4,500,000	1.50	6,750,000
Iowa	30,000	9.8	294,000	1.30	382,000
Missouri	25,000	8.1	202,000	1.15	232,000
North Dakota	1,530,000	9.3	14,229,000	1.57	22,340,000
South Dakota	600,000	9.4	5,640,000	1.51	8,516,000
Nebraska	16,000	8.5	136,000	1.22	166,000
Kansas	55,000	7.0	385,000	1.10	424,000
Oklahoma	6,000	10.0	60,000	1.20	72,000
Montana	10,000	12.0	120,000	1.60	192,000
United States	2,742,000	9.4	25,856,000	1.526	39,466,000

Average farm price of flaxseed per bushel, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January	123.2	99.3	......	......	......	......	110.0	100.0	123.4	99.3	......	......	......	98.7
February	129.8	......	......	......	......	......	115.0	......	130.1	......	......	......	......	......
March	141.3	102.9	......	......	......	......	121.0	105.0	141.7	103.0	......	100.0	......	90.0
April	145.6	103.0	......	......	......	......	130.0	105.0	145.8	103.0	......	......	......	100.0
May	148.7	104.8	......	......	......	......	138.0	106.0	148.8	104.9	......	100.0	......	95.0
June	153.4	109.2	......	......	......	......	144.0	108.0	153.5	109.3	......	......	......	......
July	153.1	108.1	......	......	......	......	141.0	109.0	153.3	108.1	......	135.0	......	103.0
August	137.0	107.4	......	......	......	......	145.0	108.0	136.9	107.4	......	100.0	......	......
September	123.1	109.6	......	......	......	......	130.0	105.0	123.0	109.6	......	......	......	115.0
October	122.8	107.0	......	......	......	......	120.0	114.0	122.8	107.0	......	......	......	102.0
November	139.8	108.3	......	......	......	......	130.0	109.0	139.9	108.4	......	......	140.0	100.0
December	152.6	118.4	......	......	......	......	135.0	115.0	152.9	118.6	120.0	110.0	160.0	100.0

FLAXSEED—Continued.

Wholesale prices of flaxseed per bushel, 1896–1909.

Date.	St. Louis.		Cincinnati.		Chicago.		Milwaukee.		Duluth	
	Prime.				No. 1 and No. 1 Northwestern.		No. 1 Northwestern.			
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1896	......	......	$0.65	$0.90	$0.63¼	$0.89½	$0.63½	$0.93	......	......
1897	$0.68	$1.13½	.65	.85	.71½	1.22½	.75	1.22¼	$0.71½	$1.21
1898	.84	1.36½	.80	.90	.85	1.39	.88	1.39	.86½	1.35
1899	.93	1.46	.90	1.00	.96½	1.51	.90	1.52	.90	1.42
1900	1.25	1.78	1.00	1.45	1.32	1.86	1.30	1.86	1.28½	1.87
1901	1.37	1.72	1.20	1.50	1.38	1.90	1.30	1.88	1.33	1.88
1902	1.11	1.65	1.25	1.40	1.13	1.80	1.18	1.80	1.15¼	1.79
1903	.86	1.17	1.00	1.30	.89	1.24	.94	1.24	.92	1.20
1904	.92½	1.18¼	1.00	1.00	.97	1.28	1.06	1.28	1.01½	1.28
1905	.90	1.30	1.10	1.10	.92	1.47	.98	1.47	.96¾	1.50
1906.										
January	1.06	1.16	1.10	....	1.06	1.25	1.12½	1.25	1.11⅛	1.24
February	1.06	1.11	1.10	......	1.06	1.16½	1.10	1.17	1.10⅞	1.16⅜
March	1.05	1.09	1.10	....	1.04½	1.14	1.11	1.14	1.10⅝	1.17½
April	1.08	1.11	1.10	1.12	1.06	1.16½	1.12	1.18	1.14¼	1.20
May	1.05	1.08	1.12	....	1.06½	1.17	1.12½	1.15¾	1.12¼	1.18
June	1.05	1.06½	1.12	....	1.07	1.13	1.11	1.13½	1.11¾	1.14⅞
July	1.03	1.07	1.12	....	1.05	1.12½	1.05	1.12½	1.11¼	1.14⅜
August	1.02	1.05	1.12	....	1.05½	1.14	1.10	1.14	1.12	1.17⅜
September	.98	1.02½	1.12	....	1.03	1.13	1.08	1.14½	1.09½	1.17⅛
October	1.03	1.07	1.12	....	1.04½	1.15	1.09½	1.13¼	1.11⅝	1.15⅝
November	1.08	1.17	1.12	....	1.07½	1.22	1.13	1.20½	1.14⅛	1.25⅝
December	1.15	1.19	1.12	....	1.11½	1.23½	1.17½	1.22	1.18⅜	1.22⅛
Year	.98	1.19	1.10	1.12	1.03	1.25	1.05	1.25	1.09¼	1.25⅝
1907.										
January	1.17	1.20	1.12	....	1.11½	1.24	1.16½	1.24½	1.17⅜	1.22⅝
February	1.18½	1.21	1.12	....	1.16	1.26	1.22½	1.24½	1.20½	1.23⅛
March	1.15	1.18½	1.12	......	1.13	1.24	1.19	1.23	1.17⅜	1.20⅝
April	1.14	1.17½	1.12	....	1.11	1.23	1.16½	1.20	1.16¼	1.21
May	1.16	1.25½	1.12	....	1.14	1.30	1.19	1.26½	1.18⅝	1.27⅜
June	1.24½	1.27	1.12	....	1.24	1.32	1.25	1.31	1.21⅜	1.29⅛
July	1.06	1.10	1.12	....	1.18½	1.26	1.20	1.25	1.16¼	1.23⅛
August	1.00	1.10	1.12	....	1.07	1.20	1.16	1.20	1.11⅝	1.20
September	1.05	1.14	1.12	....	1.13½	1.28	1.19	1.27	1.21⅛	1.26⅛
October	1.08	1.16	1.12	....	1.11	1.36½	1.16	1.34	1.22¼	1.41⅛
November	1.00	1.14	1.12	....	.96	1.21½	1.07	1.19	1.06⅛	1.22
December	1.02	1.10	1.12	......	.99½	1.20	1.07¾	1.14	1.08¾	1.17¼
Year	1.00	1.27	1.12	....	.96	1.36½	1.07	1.34	1.06½	1.41⅛
1908.										
January	1.11	1.18	1.12	....	1.09	1.22¼	1.15¾	1.20	1.14⅜	1.19
February	1.14	1.18½	1.12	....	1.06½	1.21½	1.16	1.19½	1.12⅞	1.18
March	1.13	1.16	1.12	....	1.07¾	1.20½	1.17	1.20	1.14⅛	1.17
April	1.13½	1.17½	1.12	....	1.07	1.22	1.12	1.19½	1.14⅝	1.20
May	1.16	1.20	1.12	....	1.11½	1.25½	1.19	1.26	1.19⅛	1.24⅛
June	1.18	1.19½	1.12	....	1.14¾	1.25¾	1.21	1.26	1.20½	1.24⅜
July	1.00	1.12	1.12	1.15	1.14¾	1.27¼	1.21	1.23½	1.20⅛	1.25⅜
August	1.00	1.20	1.15	1.25	1.17¼	1.35½	1.23½	1.33	1.25¼	1.34⅛
September	1.11	1.18	1.25	....	1.12⅝	1.28⅝	1.23	1.28	1.21½	1.28⅝
October	1.12	1.19	1.25	....	1.12½	1.29¼	1.23	1.29	1.21⅛	1.28⅜
November	1.19	1.35	1.25	....	1.18½	1.47	1.29	1.44⅝	1.28⅜	1.46⅞
December	1.34	1.39½	1.25	....	1.33½	1.51½	1.42¼	1.47	1.41	1.49⅜
Year	1.00	1.39½	1.12	1.25	1.06½	1.51½	1.12	1.47	1.12¾	1.49⅜
1909.										
January	1.42½	1.51	1.25	....	1.44	1.61½	1.53½	1.62¼	1.52	1.59⅛
February	1.50	1.63	1.25	....	1.50¾	1.73½	1.60	1.71	1.58⅜	1.70⅝
March	1.55	1.63	1.25	....	1.52	1.71⅛	1.60¾	1.70	1.61	1.68⅝
April	1.53	1.60	1.75	....	1.53½	1.69⅛	1.66	1.70	1.63¼	1.68¾
May	1.53¼	1.66½	1.75	....	1.55	1.82	1.66½	1.80¾	1.64⅜	1.82
June	1.50	1.65	1.75	....	1.54½	1.71½	1.64	1.78¼	1.75	1.81¾
July	1.20	1.50	1.75	....	1.29	1.65	1.40	1.66	1.39¾	1.79
August	1.15	1.35	1.75	....	1.35	1.45	1.35	1.45	1.36	1.50
September	1.32	1.38	1.75	....	1.32½	1.51	1.40	1.50	1.37⅛	1.47
October	1.35	1.60	1.75	....	1.32	1.73	1.42½	1.74½	1.36⅛	1.74⅛
November	1.55	1.72	1.75	....	1.56	1.84½	1.68	1.84	1.66⅛	1.84⅜
December	1.68	1.90	1.75	....	1.70	1.99	1.80	2.09	1.76¾	2.04⅜
Year	1.15	1.90	1.25	....	1.29	1.99	1.35	2.09	1.36⅛	2.04⅜

RICE.

Rice crop of countries named, 1904–1908.

[Mostly cleaned rice. The United States crop as given here is computed from the official returns, which are for rough rice, allowing 45 pounds rough to 1 bushel, and 162 pounds rough to 100 pounds cleaned. China, which is omitted, has a roughly estimated crop of 50,000,000,000 to 60,000,000,000 pounds. Other omitted countries are Afghanistan, Algeria, Brazil, Colombia, Federated Malay States, Persia, Trinidad and Tobago, Turkey (Asiatic and European), Venezuela, and a few other countries of small production.]

Country.	1904.	1905.	1906.	1907.	1908.
NORTH AMERICA.					
United States:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Contiguous	586,000,000	378,000,000	496,000,000	520,000,000	676,900,000
Noncontiguous—Hawaii [a]	33,400,000	33,400,000	33,400,000	33,400,000	33,400,000
Total United States (except Philippine Islands)	619,400,000	411,400,000	529,400,000	553,400,000	710,300,000
Central America:					
Guatemala	1,300,000	[b] 1,300,000	[b] 1,300,000	[b] 1,300,000	[b] 1,300,000
Honduras [c]	8,100,000	8,100,000	8,100,000	8,100,000	8,100,000
Mexico	62,000,000	55,151,000	[d] 55,151,000	[d] 55,151,000	[d] 55,151,000
Total	690,800,000	475,951,000	593,951,000	617,951,000	774,851,000
SOUTH AMERICA.					
Argentina	[e] 2,000,000	[e] 2,000,000	[e] 2,000,000	17,808,000	[f] 19,000,000
British Guiana	31,200,000	32,800,000	56,000,000	[f] 59,000,000	71,300,000
Dutch Guiana	1,900,000	2,500,000	3,298,000	3,331,000	3,685,000
Peru [c]	60,000,000	60,000,000	60,000,000	60,000,000	60,000,000
Total	95,100,000	97,300,000	121,298,000	140,139,000	153,985,000
EUROPE.					
Austria	200,000	300,000	200,000	....	....
Bulgaria	12,200,000	10,800,000	8,205,000	7,758,000	6,336,000
Italy	760,500,000	676,600,000	728,600,000	823,700,000	740,400,000
Spain	394,600,000	478,800,000	425,800,000	475,400,000	449,700,000
Total	1,167,500,000	1,166,500,000	1,162,805,000	1,306,858,000	1,196,436,000
ASIA.					
British India: [g]					
British Provinces	71,561,000,000	67,916,000,000	67,464,000,000	60,729,000,000	62,549,000,000
Native States	[f] 764,000,000	[f] 640,000,000	[f] 687,000,000	[h] 687,000,000	[i] 687,000,000
Total British India	72,325,000,000	68,556,000,000	68,151,000,000	61,416,000,000	63,236,000,000
Ceylon	558,500,000	392,000,000	283,000,000	333,000,000	309,000,000
French Indo-China [e]	5,000,000,000	5,000,000,000	5,000,000,000	5,000,000,000	5,000,000,000
Japanese Empire:					
Japan	16,060,600,000	11,920,000,000	14,459,285,000	15,317,905,000	16,217,500,000
Formosa	2,598,100,000	2,719,200,000	2,478,603,000	2,818,100,000	[h] 2,818,100,000
Total Japanese Empire	18,658,700,000	14,639,200,000	16,937,888,000	18,136,005,000	19,035,600,000
Java and Madura	6,431,000,000	6,268,000,000	6,953,000,000	6,877,000,000	[h] 6,877,000,000
Korea [l]	3,200,000,000	3,200,000,000	3,200,000,000	3,200,000,000	3,200,000,000
Philippine Islands	[d] 544,000,000	544,000,000	725,000,000	695,000,000	534,000,000
Russia, Asiatic:					
Caucasus and Turkestan	([k])	([k])	([k])	393,000,000	[h] 393,000,000
Siam [j]	6,824,000,000	6,824,000,000	6,824,000,000	6,824,000,000	6,824,000,000
Straits Settlements	[f] 95,000,000	[f] 93,000,000	[f] 94,000,000	[f] 79,000,000	[h] 79,000,000
Total	113,636,200,000	105,516,200,000	108,167,888,000	102,953,005,000	105,487,600,000

[a] Census, 1899.
[b] Data for 1904.
[c] Data for 1901.
[d] Data for 1905.
[e] Estimated average production.
[f] Estimated from official returns for acreage.
[g] Data for British India refer to crop years beginning in the spring of the calendar years mentioned in this table.
[h] Data for previous year.
[i] Data for 1906.
[j] Estimated from official returns of exports of this country, and from per capita consumption of rice in Japan, 1894-1903, including food, seed, and waste, but not including rice used for saké, (270 pounds per annum).
[k] No data.
[l] Official estimate 1903.

RICE—Continued.

Rice crop of countries named 1904–1908—Continued.

Country.	1904.	1905.	1906.	1907.	1908.
AFRICA.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
British Central Africa	2,200,000	1,800,000	1,400,000	1,978,000	[a] 1,978,000
Egypt [b]	141,000,000	164,000,000	139,000,000	150,000,000	155,000,000
Madagascar	(c)	(c)	(c)	(c)	953,000,000
Total	143,200,000	165,800,000	140,400,000	151,978,000	1,109,978,000
OCEANIA.					
Fiji [b]	3,000,000	2,800,000	2,800,000	3,800,000	2,600,000
Grand total	*115,735,800,000*	*107,424,551,000*	*110,189,142,000*	*105,173,731,000*	*108,725,450,000*

[a] Data for previous year. [b] Estimated from official returns of acreage. [c] No data.

Acreage, production, value, etc., of rice in the United States, 1904–1909.

Year.	Acreage sown and harvested.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.	Condition of growing crop. July 1.	Aug. 1.	Sept. 1.	When harvested.
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dollars.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1904	662,000	31.9	21,096,000	65.8	13,892,000	88.2	90.2	89.7	87.3
1905	460,000	28.1	12,933,000	95.0	12,286,000	88.0	92.9	92.2	89.3
1906	575,000	31.1	17,855,000	90.3	16,121,000	82.9	83.1	86.8	87.2
1907	627,000	29.9	18,738,000	85.8	16,081,000	84.7	88.6	87.0	88.7
1908	655,000	33.4	21,890,000	81.2	17,771,000	92.0	94.1	93.6	87.7
1909	720,000	33.8	24,368,000	79.4	19,341,000	90.7	84.5	84.7	81.2

Acreage, production, and value of rice in the United States in 1909, by States.

State.	Acreage.	Average yield per acre.	Production.	Average farm price Dec. 1.	Farm value Dec. 1.
	Acres.	*Bushels.*	*Bushels.*	*Cents.*	*Dollars.*
North Carolina	425	30.2	13,000	85	11,000
South Carolina	18,600	25.6	476,000	91	433,000
Georgia	4,200	23.9	100,000	87	87,000
Florida	1,000	25.0	25,000	80	20,000
Alabama	1,000	35.0	35,000	80	28,000
Mississippi	1,000	30.0	30,000	80	24,000
Louisiana	375,000	33.8	12,675,000	79	10,013,000
Texas	291,000	34.0	9,894,000	78	7,717,000
Arkansas	28,000	40.0	1,120,000	90	1,008,000
United States	720,225	33.8	24,368,000	79.4	19,341,000

RICE CROP IN THE UNITED STATES, 1712-1909.

Intelligent use of the following table depends upon observing these explanations:

PRODUCTION.—The year mentioned is that of planting, growth, and harvest. Production data obtained from following sources: South Carolina crop, 1718, letter from Governor Johnston, of Carolina, Jan. 12, 1720; 1738, Butel-Dumont; 1768, John Drayton, ex-governor of South Carolina; United States crop, 1839, 1849, 1859, 1869, 1879, 1889, 1899, Census; 1841–48, estimates of the Commissioner of Patents; 1853, estimate of the Commissioner of Agriculture; 1904–9, estimates of the Department of Agriculture.

Estimates of the marketed production of rice by Dan Talmage's Sons Company, 1819–38, 1840, 1850–58, for the Carolinas and Georgia; 1860, for the same States and Louisiana; 1861–63, for Louisiana only; 1864–65, for North Carolina and Louisiana; 1866–68, 1870–78, 1880–88, 1890–98, for the Carolinas, Georgia, and Louisiana; 1900–3, for the same States and Texas.

PRODUCTION PER ACRE.—Census estimate for 1849; Census average, 1879, 1889, 1899; Bureau of Statistics, Department of Agriculture, 1904–9.

TOTAL FARM VALUE.—Production multiplied by farm value per barrel; except, census for 1899.

FARM VALUE PER BARREL.—1839, 1845, general and usual plantation price; 1846–47, Commissioner of Patents; 1849, Census estimate; 1853, Commissioner of Agriculture; 1899, Census average; 1904–9, Bureau of Statistics, Department of Agriculture.

DOMESTIC EXPORTS OF CLEANED RICE—NET WEIGHT.—Exports of South Carolina: 1717–18, letter from governor of Carolina; 1719, 1721, F. Yonge, agent of South Carolina in London; 1724–35, Butel-Dumont; 1736–37, 1739–46, 1748–52, 1754, 1758–59, 1762–64, South Carolina Gazette quoted in Charleston Yearbook, 1880; 1738, Anderson on Commerce; 1747, Governor Glen's report to the Board of Trade; 1753, 1771, 1781–83, 1788, John Drayton; 1773, Charleston Yearbook, 1880; 1784–85, de la Rochefoucauld Liancourt; 1786, Jedediah Morse. The data were originally taken from the custom-house records of Charleston, S. C.

Exports of South Carolina and Georgia: 1760, 1770, South Carolina Gazette and Jedediah Morse; 1761, Carolina Gazette and Anderson on Commerce; 1772, John Drayton and Jedediah Morse.

Exports from all the British colonies in America: 1712-16, Colonial Records of North Carolina, imports into Great Britain from the British colonies in America and here stated as exports; 1767–69, official colonial statistics of exports of rice from British North America, quoted by Sheffield.

Exports from the United States: 1789–1801 including reexports, 1802–19 not including reexports, American State Papers; 1820 and subsequently, Bureau of Statistics, Department of Commerce and Labor. Figures for 1789 are incomplete, one quarterly return missing for Charleston, S. C. Rice bran, meal and polish are not included except for 1891, when separate data are not given for these products.

Since 1899 the shipments of rice to Hawaii and Porto Rico from the United States have been added to the domestic exports to make the data comparable with earlier years.

The years 1712–16 begin at Christmas; 1718–19, 1768–70 are calendar years and are tabulated under 1717, 1718, 1767, 1768, 1769. All the other years begin Nov. 1, as nearly as can be ascertained until 1789, which begins Aug. 1 (14-month year, partly duplicating previous year); 1790–1842 begin Oct. 1 (1842 is a 9-month year); 1843 and following years begin July 1.

DOMESTIC EXPORTS OF CLEANED RICE—TOTAL VALUE.—Before 1789 export price as quoted from the custom-house reports, or weight of exports multiplied by the Charleston market price; 1789–90, 1802–19, American State Papers; 1791–95 calculated values, based on Charleston export prices; 1820 and subsequently, Bureau of Statistics, Department of Commerce and Labor.

IMPORTS FOR CONSUMPTION, CLEANED RICE—NET WEIGHT.—Total imports less reexports, 1861–65; imports for consumption 1866 and subsequently, Bureau of Statistics, Department of Commerce and Labor. Fifty-five per cent of the weight of the imported paddy and 89 per cent of the imported uncleaned rice were counted as cleaned rice—see Customs Decision No. 21747, Treasury Department. Since 1899 the shipments of rice from Hawaii and Porto Rico to the United States have been added to the imports for consumption of the United States, to make the data comparable with previous

After Oct. 6, 1890, "Rice flour, rice meal, and broken rice which will pass through a wire sieve known commercially as No. 1," are added. Previous to that date these *by-products were omitted*.

EQUIVALENTS USED.—In trade, barrel, 1717, 350 pounds; 1719–29, 400 pounds; 1730–88, 500 pounds; 1789–1864, 400 pounds; tierce, 1789–1864, 600 pounds. In production, 1 barrel of rough rice=162 pounds=100 pounds of cleaned rice; 1 bushel of rough rice=45 pounds; 3.6 bushels of rough rice=1 barrel.

CONSUMPTION.—No account taken of stocks at beginning and end of year. The figures are taken from the formula of production plus net imports (imports for consumption, 1866 and subsequently) minus domestic exports, and do not stand for actual consumption for any certain year.

CONSUMPTION OF CLEANED RICE—PER CAPITA.—The indicated per capita consumption of cleaned rice, by 5-year periods, for food, brewing, and other purposes, follows: 1821–25, *0.54 pound; 1826–30 (apparent excess of exports)*; 1831–35, *0.72 pound*; 1836–40, 1.55 pounds; 1841–45, 1.23 pounds; 1846–50, 2.51 pounds; 1851–55, 1.57 pounds; 1856–60, 1.93 pounds; 1861–65, 1.91 pounds; 1866–70, 2.32 pounds; 1871–75, *2.75 pounds; 1876–80, 3.02 pounds; 1881–85, 3.50 pounds; 1886–90, 3.80 pounds*; 1891–95, 4.58 pounds; 1896–1900, 4.17 pounds; 1901–5, 5.97 pounds.

FIVE-YEAR AVERAGES.—The percentages of production retained for consumption and the per capita consumption are weighted averages.

GOLD VALUE.—All values have been reduced to gold for 1861–1878.

AUTHORITIES.—North Carolina Colonial Records, Anderson's Commerce, South Carolina Gazette, American State Papers, American Husbandry, Sheffield's Observations on the Commerce of the American States, Bureau of the Census, Commissioner of Patents; Wm. J. Rivers, History of South Carolina; F. Yonge, Agent of South Carolina in London, Address to the Rt. Hon. John Lord Carteret; Georges Marie Butel-Dumont, Histoire et commerce des Colonies Angloises daus l'Amèrique septentrionale; John Drayton, A View of South Carolina; Governor Glen's report to the Board of Trade, 1749; F. A. F. de la Rochefoucauld Liancourt, Travels through the United States; Alexander Hewatt, An historical account of South Carolina and Georgia; David Ramsey, History of South Carolina, 1670–1808; Jedediah Morse, American Geography, 1789; W. G. Simms, History of South Carolina; De Bow, Industries of Southern and Western States; Charleston, S. C., Yearbook, 1880; Bureau of Statistics, Department of Commerce and Labor; Bureau of Statistics, Department of Agriculture.

RICE—Continued.

Production, value, domestic exports, imports, and consumption of rice for the United States, 1712–1909.

Year.	Production. Total. Rough.	Production. Total. Cleaned.	Production. Per acre, rough.	Farm value, rough. Total.	Farm value, rough. Per barrel.	Fiscal year beginning in the year mentioned. Domestic exports, cleaned. Net weight.	Domestic exports, cleaned. Total value.	Imports for consumption, cleaned. Net weight.	Imports for consumption, cleaned. Total value.	Retained and received for consumption. Net weight, cleaned.	Retained and received for consumption. Per cent of production.
	Barrels.	*Pounds.*	*Barrels.*	*Dollars.*	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Per cent.*
1694 a											
1712						3,144,176					
1713						3,144,176					
1714						3,144,176					
1715						3,144,176					
1716						3,144,176					
1717						3,187,100					
1718	49,000	4,900,000				3,190,250				1,709,750	34.9
1719						5,443,600	118,265				
1721						8,751,600	94,570				
1724						7,093,600					
1725						9,212,400					
1726						10,753,600					
1727						11,962,000					
1728						12,953,600					
1729						16,688,800					
1730						19,743,500	288,255				
1731						18,534,000					
1732						25,369,000					
1733						15,161,500					
1734						22,866,100					
1735						26,485,300					
1736						21,413,300	623,226				
1737						17,162,000					
1738	400,000	40,000,000				35,742,000	695,754			4,258,000	10.6
1739						45,555,000	997,620				
1740						40,447,400	1,082,605				
1741						23,098,000					

1742	.....	.....	.....	.....	.....	36,708,000	714,558	.....	.....	.....	.....
1743	.....	.....	.....	.....	.....	40,389,000	540,048	.....	.....	.....	.....
1744	.....	.....	.....	.....	.....	29,813,500	253,903	.....	.....	.....	.....
1745	.....	.....	.....	.....	.....	27,050,500	263,282	.....	.....	.....	.....
1746	.....	.....	.....	.....	.....	27,073,000	606,053	.....	.....	.....	.....
1747	.....	.....	.....	.....	.....	27,566,000	430,161	.....	.....	.....	.....
1748	.....	.....	.....	.....	.....	20,517,000	390,384	.....	.....	.....	.....
1749	.....	.....	.....	.....	.....	24,110,500	.....	.....	.....	.....	.....
1750	.....	.....	.....	.....	.....	30,805,600	554,685	.....	.....	.....	.....
1751	.....	.....	.....	.....	.....	39,217,200	1,335,953	.....	.....	.....	.....
1752	.....	.....	.....	.....	.....	17,761,000	388,952	.....	.....	.....	.....
1753	.....	.....	.....	.....	.....	52,341,000	891,509	.....	.....	.....	.....
1754	.....	.....	.....	.....	.....	48,389,000	941,940	.....	.....	.....	.....
1758	.....	.....	.....	.....	.....	25,942,400	.....	.....	.....	.....	.....
1759	.....	.....	.....	.....	.....	30,403,300	606,028	.....	.....	.....	.....
1760	.....	.....	.....	.....	.....	52,341,600	955,201	.....	.....	.....	.....
1761	.....	.....	.....	.....	.....	43,592,300	636,426	.....	.....	.....	.....
1762	.....	.....	.....	.....	.....	50,529,500	1,229,509	.....	.....	.....	.....
1763	.....	.....	.....	.....	.....	50,921,000	991,228	.....	.....	.....	.....
1764	.....	.....	.....	.....	.....	53,646,000	1,305,341	.....	.....	.....	.....
1767	.....	.....	.....	.....	.....	68,266,500	1,494,984	.....	.....	.....	.....
1768	700,000	70,000,000	.....	.....	.....	67,234,000	1,472,638	.....	.....	2,766,000	4.0
1769	.....	.....	.....	.....	.....	75,492,300	1,660,976	.....	.....	.....	.....
1770	.....	.....	.....	.....	.....	76,510,700	2,606,375	.....	.....	.....	.....
1771	.....	.....	.....	.....	.....	70,000,000	2,384,585	.....	.....	.....	.....
1772	.....	.....	.....	.....	.....	68,077,500	2,319,094	.....	.....	.....	.....
1773	.....	.....	.....	.....	.....	62,538,000	.....	.....	.....	.....	.....
1782	.....	.....	.....	.....	.....	12,112,000	.....	.....	.....	.....	.....
1783	.....	.....	.....	.....	.....	30,987,000	.....	.....	.....	.....	.....
1784	.....	.....	.....	.....	.....	31,856,500	.....	.....	.....	.....	.....
1785	.....	.....	.....	.....	.....	32,928,500	.....	.....	.....	.....	.....
1786	.....	.....	.....	.....	.....	32,597,500	.....	.....	.....	.....	.....
1788	.....	.....	.....	.....	.....	50,000,000	.....	.....	.....	.....	.....
1789	.....	.....	.....	.....	.....	[b] 60,507,000	[b] 1,753,796	.....	.....	.....	.....
1790	.....	.....	.....	.....	.....	74,136,000	1,915,180	.....	.....	.....	.....
1791	.....	.....	.....	.....	.....	85,057,200	1,937,596	.....	.....	.....	.....
1792	.....	.....	.....	.....	.....	80,766,600	2,319,056	.....	.....	.....	.....
1793	.....	.....	.....	.....	.....	69,891,600	1,873,353	.....	.....	.....	.....
1794	.....	.....	.....	.....	.....	83,115,600	2,946,176	.....	.....	.....	.....
1795	.....	.....	.....	.....	.....	78,623,400	4,515,494	.....	.....	.....	.....
1796	.....	.....	.....	.....	.....	36,066,600	.....	.....	.....	.....	.....
1797	.....	.....	.....	.....	.....	75,145,800	.....	.....	.....	.....	.....

[a] Seed obtained by governor of Carolina *from ship from* Madagascar.

[b] One quarterly return missing for Charleston, S. C.

RICE—Continued.

Production, value, domestic exports, imports, and consumption of rice for the United States, 1712–1909—Continued.

Year.	Production.			Farm value, rough.		Fiscal year beginning in the year mentioned.				Retained and received for consumption.	
	Total.		Per acre, rough.	Total.	Per barrel.	Domestic exports, cleaned.		Imports for consumption, cleaned.		Net weight, cleaned.	Per cent of production.
	Rough.	Cleaned.				Net weight.	Total value.	Net weight.	Total value.		
	Barrels.	*Pounds.*	*Barrels.*	*Dollars.*	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Per cent.*
1798						66,359,400					
1799						67,233,600					
1800						50,919,600					
1801						47,893,200					
1802						49,102,800	2,455,000				
1803						47,031,000	2,350,000				
1804						34,098,000	1,705,000				
1805						61,576,200	2,617,000				
1806						56,815,200	2,367,000				
1807						5,336,800	221,000				
1808						70,144,200	2,104,000				
1809						78,804,600	2,626,000				
1810						71,613,600	2,387,000				
1811						46,314,000	1,544,000				
1812						72,505,800	3,021,000				
1813						6,885,600	230,000				
1814						77,548,800	2,785,000				
1815						82,705,800	3,555,000				
1816						47,577,600	2,378,880				
1817						52,908,600	3,262,697				
1818						45,913,800	2,142,644				
1819	532,920	53,292,000				42,997,800	1,714,923			10,294,200	19.3
1820	693,546	69,354,600				52,932,600	1,494,307			16,422,000	23.7
1821	605,442	60,544,200				52,253,400	1,553,482			8,290,800	13.7
1822	619,512	61,951,200				60,819,000	1,820,985			1,132,200	1.8
1823	754,638	75,463,800				67,937,400	1,882,982			7,526,400	10.0
1824	661,332	66,133,200				58,209,000	1,925,245			7,924,200	12.0
1825	703,488	70,348,800				66,637,800	1,917,445			3,711,000	5.3

1836	796,866	79,686,600				80,110,800	2,343,908			a 424,200	
1837	874,068	87,406,800				105,011,400	2,620,696			a 17,604,600	
1838	923,556	92,355,600				102,981,600	2,514,370			a 10,626,000	
1839	875,658	87,565,800				78,418,200	1,986,824			9,147,600	10.4
1830	813,516	81,351,600				69,910,200	2,016,267			11,441,400	14.1
1831	911,550	91,155,000				72,196,200	2,152,631			18,958,800	20.8
1832	1,069,530	106,953,000				86,497,800	2,744,418			20,455,200	19.1
1833	872,226	87,222,600				73,131,600	2,122,272			14,091,000	16.2
1834	906,000	90,600,000				66,510,600	2,210,331			24,089,400	26.6
1835	1,013,106	101,310,600				127,789,800	2,548,750			a 26,479,200	
1836	905,748	90,574,800				63,650,400	2,309,279			26,924,400	29.7
1837	716,046	71,604,600				42,628,800	1,721,819			28,975,800	40.5
1838	819,498	81,949,800				55,992,000	2,460,198			25,957,800	31.7
1839	808,414	80,841,422		2,021,035	2.50	60,996,000	1,942,076			19,845,422	24.5
1840	842,526	84,252,600				60,970,200	2,010,107			23,282,400	27.6
1841	889,530	88,952,968				68,770,200	1,907,387			20,182,768	22.7
1842	940,075	94,007,484				64,059,600	1,625,726			29,947,884	31.9
1843	898,791	89,879,145				80,829,000	2,182,468			9,050,145	10.1
1844	1,117,590	111,759,000				71,172,600	2,160,456			40,586,400	36.3
1845	897,650	89,765,000		3,590,600	4.00	74,404,200	2,564,991			15,360,800	17.1
1846	977,415	97,741,500		3,786,483	3.87	86,656,200	3,605,896			11,085,300	11.3
1847	1,030,405	103,040,500		3,091,215	3.00	60,241,800	2,331,824			42,798,700	41.5
1848	1,191,995	119,199,500				77,316,600	2,569,362			41,882,900	35.1
1849	2,153,135	215,313,497	12.3	4,000,000	1.86	76,241,400	2,631,557			139,072,097	64.6
1850	1,027,758	102,775,800				63,354,000	2,170,927			39,421,800	38.4
1851	1,057,338	105,733,800				71,839,800	2,471,029			33,894,000	32.1
1852	1,024,674	102,467,400				40,624,200	1,657,658			61,843,200	60.4
1853	1,014,306	101,430,600				63,072,600	2,634,127			38,358,000	37.8
1854	708,720	70,872,000				39,421,600	1,717,953			31,450,400	44.4
1855	1,036,062	103,606,200				67,616,000	2,390,233			35,990,200	34.7
1856	995,646	99,564,600				68,322,800	2,290,400			31,241,800	31.4
1857	1,082,436	108,243,600				58,122,200	1,870,578			50,121,400	46.3
1858	1,162,932	116,293,200				77,070,400	2,207,148			39,222,800	33.7
1859	1,871,670	187,167,032				81,632,600	2,567,390			105,534,432	56.4
1860	1,052,792	105,279,200				43,512,400	1,382,178			61,766,800	58.7
1861	20,518	2,051,830				4,221,600	156,899	52,931,536	1,485,461	50,761,766	2,474.0
1862	20,863	2,086,280				1,694,900	83,404	51,907,689	1,367,941	52,799,169	2,506.8
1863	15,808	1,580,790				2,176,800	84,217	90,207,906	1,458,606	89,611,896	5,668.8
1864	47,406	4,740,580				983,200	65,105	48,955,869	933,643	52,713,249	1,112.0
1865	102,465	10,246,490				2,212,901	136,993	66,254,330	2,042,841	74,287,939	725.0
1866	251,545	25,154,530				1,394,007	100,338	46,555,056	1,694,828	72,815,569	289.7
1867	278,138	27,813,790				3,079,043	170,357	43,778,772	1,210,787	68,513,519	246.3

a Excess of exports over production.

RICE—Continued.

Production, value, domestic exports, imports, and consumption of rice for the United States, 1712–1909—Continued.

Year.	Production.			Farm value, rough.		Fiscal year beginning in the year mentioned.				Retained and received for consumption.	
	Total.		Per acre, rough.	Total.	Per barrel.	Domestic exports, cleaned.		Imports for consumption, cleaned.		Net weight, cleaned.	Per cent of production.
	Rough.	Cleaned.				Net weight.	Total value.	Net weight.	Total value.		
	Barrels.	*Pounds.*	*Barrels.*	*Dollars.*	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Per cent.*
1868	436,519	43,651,910				2,232,833	145,934	36,188,559	981,173	77,607,636	177.8
1869	736,350	73,635,021				2,133,014	127,655	33,606,275	799,741	105,108,282	142.7
1870	548,889	54,888,880				445,842	22,502	50,659,834	1,449,198	105,102,872	191.5
1871	393,260	39,325,990				403,835	28,768	53,545,533	1,674,401	92,467,688	235.1
1872	522,758	52,275,780				276,637	19,740	54,580,588	1,663,786	106,579,731	203.9
1873	624,004	62,400,380				558,922	27,075	59,330,435	1,620,385	121,171,893	194.2
1874	678,134	67,813,400				277,337	19,831	50,982,298	1,349,330	118,518,361	174.8
1875	838,608	83,860,800				439,991	30,918	50,720,709	1,240,949	134,141,518	160.0
1876	866,282	86,628,200				1,306,982	78,112	50,632,561	1,244,285	135,953,779	156.9
1877	777,324	77,732,400				631,105	33,953	46,172,628	1,318,508	123,273,923	158.6
1878	815,138	81,513,800				740,136	35,538	55,393,226	1,749,645	136,166,890	167.0
1879	1,101,314	110,131,373	6.4			183,534	13,366	51,820,122	1,520,718	161,767,961	146.9
1880	1,118,690	111,868,990				150,451	10,072	49,128,463	1,390,037	160,847,002	143.8
1881	1,026,048	102,604,810				143,289	10,109	73,978,940	1,927,333	176,440,461	172.0
1882	999,850	99,985,000				136,143	8,679	78,626,250	2,040,396	178,475,107	178.5
1883	1,107,000	110,700,000				163,519	9,870	84,563,181	2,081,035	195,099,662	176.2
1884	1,095,616	109,561,600				168,827	10,619	76,585,228	1,866,574	185,978,001	169.7
1885	1,501,950	150,195,000				256,311	14,241	55,181,869	1,346,088	205,120,558	136.6
1886	1,556,695	155,669,500				644,384	29,204	46,617,668	1,140,449	201,642,784	129.5
1887	1,136,307	113,630,700				398,535	22,234	92,287,042	2,132,330	205,519,207	180.9
1888	1,247,332	124,733,200				439,706	24,124	96,084,903	2,078,010	220,378,397	176.7
1889	1,285,909	128,590,934	8.0			388,914	20,728	79,896,214	1,794,928	208,098,234	161.8
1890	1,368,000	136,800,000				540,620	33,012	167,075,722	3,603,880	303,335,102	221.7
1891	1,556,656	155,665,600				a 10,256,797	89,340	143,666,944	3,052,431	289,075,747	185.7
1892	2,375,469	237,546,900				758,992	25,126	137,220,387	2,703,821	374,010,295	157.4
1893	1,228,652	122,865,160				763,425	19,884	120,368,197	2,108,218	242,469,932	197.3
1894	1,098,208	109,820,800				124,296	4,687	200,614,068	3,265,143	310,310,562	282.6
1895	1,686,854	168,685,440				1,346,876	14,117	135,563,114	2,058,241	302,901,078	179.6

1896	968,864	96,886,400				387,288	14,617	183,965,394	3,335,533	280,464,508	289.5
1897	1,163,018	116,301,760				637,146	27,501	167,193,971	3,315,583	282,858,585	243.2
1898	1,369,907	136,990,720				852,704	38,511	166,436,082	3,440,145	302,574,098	220.9
1899	2,502,802	250,280,227	7.3	6,329,562	2.53	12,947,009	500,364	102,983,404	2,090,550	340,316,622	136.0
1900	2,531,302	253,139,200				37,886,640	1,352,532	102,150,653	2,112,412	317,403,213	125.4
1901	3,880,352	388,035,200				51,135,786	1,832,772	132,843,296	2,526,089	469,742,710	121.1
1902	3,193,930	319,392,960				64,417,713	2,428,759	145,111,635	2,610,171	400,086,882	125.3
1903	5,607,500	560,750,000				70,394,224	2,558,802	121,387,622	2,342,442	611,743,398	109.1
1904	5,860,011	586,001,055	8.8	13,891,523	2.37	165,686,172	5,066,095	94,275,387	1,785,433	514,590,270	87.8
1905	3,592,621	359,262,111	7.8	12,285,834	3.42	100,339,349	3,650,747	145,924,993	2,835,258	404,847,755	112.7
1906	4,959,658	495,965,778	8.6	16,121,298	3.25	105,264,996	4,283,480	176,699,398	3,566,581	567,400,180	114.4
1907	5,205,000	520,500,000	8.3	16,081,000	3.09	84,271,933	3,580,601	174,309,014	3,933,059	610,537,081	117.3
1908	6,080,560	608,056,000	9.3	17,771,000	2.92	94,614,370	3,545,539	185,397,508	4,092,641	701,839,138	115.4
1909	6,768,890	676,889,000	9.4	19,341,000	2.86						
Average:											
1789-1795						76,013,914	2,465,807				
1796-1800						60,345,000					
1801-1805						47,940,240					
1806-1810						56,582,880	1,941,000				
1811-1815						57,192,000	2,227,000				
1816-1820						48,466,080	2,198,690				
1821-1825	668,882	66,888,240				61,171,320	1,820,028			5,716,920	8.5
1826-1830	856,733	85,673,280				87,286,440	2,296,413			[b] 1,613,160	
1831-1835	954,482	95,448,240				85,225,200	2,355,680			10,223,040	10.7
1836-1840	818,446	81,844,644				56,847,480	2,088,696			24,997,164	30.5
1841-1845	948,727	94,872,719				71,847,120	2,088,206			23,025,599	24.3
1846-1850	1,276,142	127,614,159				72,762,000	2,661,913			54,852,159	43.0
1851-1855	968,220	96,822,000				56,514,840	2,174,200			40,307,160	41.6
1856-1860	1,233,095	123,309,526				65,732,080	2,063,541			57,577,446	46.7
1861-1865	41,412	4,141,104				2,257,860	105,324	62,051,470	1,457,609	63,934,804	1,543.9
1866-1870	450,288	45,028,824				1,856,948	113,357	42,617,699	1,227,141	85,789,575	190.5
1871-1875	611,353	61,135,270				391,344	25,266	53,831,913	1,509,770	114,575,839	187.4
1876-1880	935,750	93,574,953				602,442	34,208	50,629,409	1,444,639	143,601,911	153.5
1881-1885	1,146,093	114,609,282				173,615	10,704	73,757,094	1,852,285	188,222,758	164.2
1886-1890	1,318,849	131,884,867				482,432	25,860	96,392,310	2,149,919	227,794,745	172.7
1891-1895	1,589,168	158,916,780				2,649,677	30,631	147,486,540	2,637,571	303,753,643	191.1
1896-1900	1,707,197	170,719,661				10,542,157	386,705	144,545,901	2,858,845	304,723,405	178.5
1901-1905	4,426,883	442,688,265				90,394,649	3,107,395	127,906,587	2,419,879	480,202,203	108.5

[a] Including bran, meal, and polish, which are not separately stated in the returns.

[b] Excess of exports over production.

RICE—Continued.

Wholesale prices of rice per pound, 1896–1909.

Date.	New York. Domestic (good). Low.	New York. Domestic (good). High.	Cincinnati. Prime.[a] Low.	Cincinnati. Prime.[a] High.	Lake Charles. Rough.[b] Low.	Lake Charles. Rough.[b] High.	New Orleans. Honduras, cleaned. Low.	New Orleans. Honduras, cleaned. High.	Houston. Head rice, cleaned. Low.	Houston. Head rice, cleaned. High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Dolls.*	*Dolls.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1896	3½	4⅜	2½	6½	......	......	......	......	......	......
1897	4⅛	4⅝	3½	6¾	......	......	4¼	4⅞	......	......
1898	4¾	5⅜	5½	7	......	......	4½	5½	......	......
1899	4¾	5½	5¼	6¾	......	......	3¾	6⅜	......	......
1900	4¾	5	5⅜	6	......	......	3¾	6⅜	......	......
1901	4¾	5	5½	6⅛	1.70	3.50	1¾	6⅝	3	5
1902	4½	5¼	5¼	6½	1.75	3.40	1½	6¼	3½	5¾
1903	4¼	5¼	4⅜	5½	1.50	3.60	1⅛	6¼	4	6¼
1904	3⅝	4¼	3¾	5¼	1.00	3.00	1 7/16	5¼	3	4⅜
1905	3⅝	4½	3	5¼	1.00	3.85	1	5¼	3	5
1906.										
January	5	5½	4½	5½	2.25	3.85	2⅝	5⅜	4	5½
February	5	5¼	4½	5¼	2.25	3.85	2⅜	5½	4	5¼
March	5	5	4½	5¼	2.25	3.85	2	5¼	4	5⅜
April	4⅞	5	4½	5½	......	......	2½	5⅜	3½	5
May	4⅞	5	4¾	5½	......	......	1⅞	6	3½	5
June	5	5¼	4¾	5½	......	......	2⅛	5¾	3¾	5¼
July	5½	5¾	4¾	5½	......	......	2⅛	5¾	3¾	5¼
August	5½	5½	4¾	5½	2.50	3.85	2	6¼	3¾	5½
September	5¼	5½	4¼	5½	2.50	3.85	2⅜	5⅝	3¾	5¼
October	5⅜	5½	4¾	5½	2.25	3.85	2⅛	5⅝	4¼	5¼
November	5¼	5⅜	4¾	5½	2.25	3.50	2	5⅝	4½	5⅝
December	5	5¼	4⅜	5½	2.00	3.25	1¾	5¾	4	5¼
Year	4⅞	5½	4½	5½	2.00	3.85	1⅛	6	3½	5⅝
1907.										
January	5	5¼	4¾	5½	2.00	3.50	1¾	6	5	5⅛
February	5	5¼	4¾	5⅜	2.00	3.50	1¾	6	5⅛	5¼
March	5	5¼	4¾	5⅜	2.25	3.50	1½	5½	5⅛	5¼
April	5⅛	5¼	4¾	5½	1.75	3.00	1⅜	5¾	5⅛	5¼
May	5¼	5⅜	4¾	5¾	......	......	1⅞	6	5⅜	5¾
June	5¼	5¾	5	6	......	......	2⅛	6⅛	6	6
July	5¾	6	5	6	......	......	2⅛	6½	6⅛	6¼
August	5⅞	6	5	6	......	......	2	6½	6⅛	6¼
September	5¾	6	5	6	2.35	3.60	2¼	6 3/16	5⅝	5¾
October	5½	5¾	4¾	6	2.35	4.10	2	6⅜	5⅜	5½
November	5¼	5½	4¾	5¾	2.60	3.90	2	5⅞	4⅝	5⅛
December	5	5¼	4¾	5¾	2.00	3.90	1⅞	6	4⅝	5⅛
Year	5	6	4¾	6	1.75	4.10	1½	6½	4⅞	6¼
1908.										
January	5	5¼	6¾	7½	2.25	3.75	2	6	4¾	5¼
February	5¼	5⅜	6¾	7½	2.00	4.25	2	6 1/16	5	5½
March	5⅜	5⅜	6¾	7½	2.25	4.33	2⅛	6¼	5	5⅜
April	5¾	5⅝	6¾	7½	......	......	2½	6¼	5⅜	5¾
May	5¾	5⅝	6¾	7½	......	......	2⅝	6⅜	5⅜	6
June	5⅝	6¼	6¾	7½	......	......	2⅛	6¼	5¼	6⅛
July	6¼	6¼	6¾	7½	......	......	3	7⅛	5⅜	6½
August	6¼	6½	6¾	7½	2.50	3.50	2¼	7	5⅜	6
September	5¾	6	6½	7½	2.00	3.60	1⅝	6	5¼	5⅜
October	5¼	5½	6½	6¾	1.75	3.75	1⅜	6	5	5⅝
November	5	5⅜	6½	6¾	2.25	3.60	1⅜	5¾	4¾	5¼
December	5	5¼	6½	6¾	1.75	3.40	1¼	5¾	4⅝	5¼
Year	5	6½	[c] 6½	7½	1.75	4.33	1¾	7⅛	4¾	6⅛
1909.										
January	5	5¼	6½	7	1.75	3.75	1⅜	6	4¾	5⅜
February	5¼	5⅜	6½	7	2.00	3.63	1⅝	6 1/16	4⅝	5¼
March	5⅜	5⅜	6½	7	2.25	3.63	2	6⅜	4⅝	5⅜
April	5⅜	5⅝	6½	7	2.25	3.60	2	6⅜	5	5½
May	5⅜	5⅝	6½	7	2.00	3.40	2	6 1/16	5⅜	5⅝
June	5⅜	5⅝	6½	7	1.75	3.00	1¾	6⅜	5¼	5¾
July	5⅛	5¾	6½	7	......	......	1¾	6⅜	5⅜	6⅛
August	[d] 5⅜	[d] 6	6¼	7	......	......	1¾	6⅜	5⅜	5¾
September	5⅜	5½	6½	7	1.50	3.25	1½	5⅝	5¼	5⅝
October	5	5⅜	6	7	2.00	3.50	1½	6	5	5⅝
November	4⅞	5	6	6¼	1.75	3.25	1⅜	5½	4⅝	5¼
December	4¾	4⅝	6	6½	1.50	3.30	1⅜	5¼	4⅝	5⅛
Year	4¾	5⅜	6	7	1.50	3.75	1½	6¼	4⅝	6⅛

[a] Louisiana grade, 1896 to 1901. [b] Per barrel of 162 pounds. [c] Fancy head. [d] New crop.

RICE—Continued.

International trade in rice, 1904–1908.[a]

[Mostly cleaned rice.]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Belgium	Jan. 1	60,704,820	41,023,262	73,215,968	61,676,146	84,552,734
British India	Jan. 1	5,561,706,206	5,110,049,504	4,284,929,600	4,294,019,202	3,736,183,475
Dutch East Indies	Jan. 1	105,792,310	98,247,103	100,703,857	116,357,243	[b] 51,194,683
Formosa	Jan. 1	197,154,447	221,561,825	161,759,068	119,264,963	221,467,740
France	Jan. 1	52,017,359	54,089,610	69,981,537	98,089,781	89,996,728
French Indo-China	Jan. 1	2,128,799,044	1,369,646,421	1,623,918,163	3,033,566,212	[c] 3,033,566,212
Germany [d]	Jan. 1	*181,073,762*	*222,773,526*	*300,225,293*	*338,463,711*	*318,752,101*
Netherlands	Jan. 1	298,075,104	282,611,808	295,873,665	315,264,586	375,562,261
Penang	Jan. 1	154,148,400	213,530,667	279,941,999	344,022,843	[c] 344,022,843
Siam	Jan. 1	1,892,988,933	1,835,880,400	1,921,339,467	1,779,013,333	[c] 1,779,013,333
Singapore	Jan. 1	702,571,733	672,031,467	689,046,531	677,447,819	[c] 677,447,819
Other countries	......	517,791,000	678,783,223	682,841,706	820,990,492	[b] 813,492,899
Total	......	11,852,915,120	10,801,128,816	10,483,776,764	11,998,176,331	11,525,254,778

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	189,403,926	158,519,564	224,874,090	129,110,161	161,791,256
Belgium	Jan. 1	140,564,807	132,971,397	149,701,442	135,585,126	183,297,724
Brazil	Jan. 1	134,043,452	129,413,871	88,821,786	25,532,770	14,920,882
British India	Jan. 1	195,294,176	344,832,880	315,943,712	237,331,883	319,184,659
Ceylon	Jan. 1	699,259,006	714,172,144	731,312,784	741,024,347	658,536,176
China	Jan. 1	447,577,333	297,055,467	624,860,267	1,702,025,200	898,215,467
Cuba	Jan. 1	196,439,462	214,934,597	192,766,374	258,424,609	[c] 258,424,609
Dutch East Indies	Jan. 1	678,382,754	661,106,710	762,003,092	599,813,423	[b] 744,304,710
Egypt	Jan. 1	104,163,198	89,979,896	101,814,530	95,401,175	102,472,583
France	Jan. 1	412,469,802	375,080,970	387,572,768	345,998,355	444,436,902
Germany [d]	Jan. 1	*602,833,603*	*627,278,011*	*671,849,295*	*750,601,700*	*1,096,182,896*
Japan	Jan. 1	1,964,238,000	1,546,121,733	813,478,133	902,701,867	647,138,933
Mauritius	Jan. 1	159,853,482	114,012,106	134,012,761	131,022,323	[c] 131,022,823
Netherlands	Jan. 1	523,497,732	493,955,916	561,916,461	566,643,424	673,530,815
Penang	Jan. 1	252,778,533	263,046,133	276,500,933	292,286,300	[c] 292,286,300
Philippine Islands	Jan. 1	585,880,567	483,411,974	280,101,412	262,399,906	349,175,386
Russia	Jan. 1	157,232,062	177,144,824	210,598,294	193,910,846	[b] 244,230,866
Singapore	Jan. 1	900,587,600	816,150,667	810,458,665	803,864,402	[c] 803,864,402
United Kingdom	Jan. 1	*620,591,664*	*685,939,744*	*768,403,216*	*584,189,966*	*618,651,635*
United States	Jan. 1	136,587,147	109,544,299	209,152,583	203,560,814	217,345,610
Other countries	......	1,199,722,000	1,195,514,115	1,284,847,364	1,241,719,828	[b] 1,214,698,837
Total	......	10,301,400,308	9,629,189,018	9,600,989,902	10,203,198,427	10,073,702,971

[a] See "General note," p. 442.
[b] Preliminary.
[c] Year preceding.
[d] Not including free ports prior to March 1, 1906.

HOPS.

Hop crop of countries named, 1905–1909.

[Excluding Canada, for which the census of 1901 shows a production during the preceding year of 1,004,216 pounds. Other omitted countries are of very small production.]

Country.	1905.	1906.	1907.	1908.	1909.
NORTH AMERICA.					
United States: [a]	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
New York	9,360,000	12,006,000	9,000,000	8,000,000	8,000,000
California	14,235,000	15,520,000	15,000,000	12,000,000	12,000,000
Oregon	22,191,000	23,985,000	23,000,000	16,000,000	13,000,000
Washington	9,750,000	8,775,000	7,000,000	3,000,000	3,000,000
Total	55,536,000	60,286,000	54,000,000	39,000,000	36,000,000
EUROPE.					
Austria-Hungary:					
Austria	39,305,000	15,012,000	29,975,000	41,331,000	[b] 16,100,000
Hungary	775,000	1,647,000	2,254,000	2,005,000	[b] 2,200,000
Total Austria-Hungary	40,080,000	16,659,000	32,229,000	43,336,000	[b] 18,300,000

[a] Estimate based upon reports to California Fruit Grower and American Agriculturist.
[b] Preliminary.

HOPS—Continued.

Hop crop of countries named, 1905-1909—Continued.

Country.	1905.	1906.	1907.	1908.	1909.
EUROPE—continued.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Belgium	11,281,000	7,705,000	6,790,000	10,140,000	[a] 2,500,000
France	11,065,000	9,156,000	8,672,000	7,936,000	[a] 3,000,000
Germany	64,500,000	46,384,000	53,255,000	58,069,000	13,356,000
Netherlands [b]	158,000	158,000	158,000	158,000	158,000
Russia	14,500,000	10,834,000	12,639,000	9,750,000	[a] 8,125,000
United Kingdom: England	77,946,000	27,517,000	41,902,000	52,725,000	24,022,000
Total	219,530,000	118,413,000	155,645,000	182,114,000	69,461,000
AUSTRALASIA.					
Australia:					
Victoria	162,000	213,000	312,000	132,000	[c] 132,000
Tasmania	912,000	989,000	1,356,000	1,402,000	[c] 1,402,000
New Zealand	1,120,000	[d] 1,097,000	[d] 1,100,000	[d] 941,000	[c] 941,000
Total	2,194,000	2,299,000	2,768,000	2,475,000	2,475,000
Grand total	277,200,000	180,998,000	212,413,000	223,589,000	107,936,000

[a] Preliminary.
[b] Estimated average, 1900-1903.
[c] Year preceding.
[d] Estimate based on the official figures of area, multiplied by yield as given in census of 1895, 1,088 pounds.

HOP CROP OF THE UNITED STATES, 1790-1909.

Intelligent use of the following table depends upon observing these explanations:

YEAR.—The year mentioned is, for production, that of planting and growth. The year for exports and imports begins October 1 (of the growth year) for the period 1790-1842 (1842 is a 9-month year); July 1 for 1843 and subsequently.

PRODUCTION.—1839, 1849, 1859, 1869, 1879, 1889, 1899, Census; 1847, 1853, estimates of the Commissioner of Patents; 1862-64, 1877, estimates of the Department of Agriculture; 1844-45, commercial estimates in Hunt's Magazine; 1890-98, 1900, commercial estimates for the States of New York, California, Oregon, and Washington in the American Agriculturist; 1901-9, commercial estimates for the State of New York in the American Agriculturist, and for California, Oregon, and Washington in the California Fruit Grower.

TOTAL FARM VALUE.—Production multiplied by farm price per pound; except census for 1899.

FARM PRICE PER POUND.—1847 and 1853, estimates of Commissioner of Patents; 1849, 1869, 1899, Census; 1896-98, 1900-5, American Agriculturist; 1906 and subsequently, Bureau of Statistics, Department of Agriculture.

DOMESTIC EXPORTS.—Including reexports 1790-1801, not including reexports 1802-19, American State Papers; 1820-1908, Bureau of Statistics, Department of Commerce and Labor.

IMPORTS FOR CONSUMPTION.—Imports for consumption 1865 and subsequently, Bureau of Statistics, Department of Commerce and Labor.

CONSUMPTION.—No account taken of stocks at beginning and end of year. The figures are obtained by adding the imports for consumption to production and deducting domestic exports, and do not stand for consumption for any certain year.

CONSUMPTION OF HOPS PER CAPITA.—The indicated per capita consumption of hops, by 5-year periods, follows: 1891-95, 0.52 pound; 1896-1900, 0.36 pound; 1901-5, 0.48 pound.

FIVE-YEAR AVERAGES.—The percentages of production retained for consumption are weighted averages; farm values per pound and export values per pound are means.

GOLD VALUES.—All values have been reduced to gold for 1861-78.

BEER BREWED.—1795 from Pabst, the Brewing Industry; 1810 from George Ehret, History of American Beer; 1839, 1849, and 1859 from Census; other years from Internal Revenue reports. Figures for 1862 cover 9 months beginning September 1, 1862. Internal Revenue and Census figures are for all fermented liquors; subsequent to 1896 figures include fermented liquors removed from breweries for export free of tax.

HOPS—Continued.

Production, value, domestic exports, imports, and consumption of hops for the United States, 1790–1909.

Year.	Production.	Farm value.		Fiscal year beginning in year mentioned.							Beer brewed, U. S. barrels of 31 gallons.
				Domestic exports.			Imports for consumption.		Retained and received for consumption.		
		Total.	Per pound.	Net weight.	Value. Total.	Value. Per pound.	Net weight.	Total value.	Net weight.	Percentage of production.	
	Pounds.	*Dollars.*	*Cents.*	*Pounds.*	*Dollars.*	*Cents.*	*Pounds.*	*Dollars.*	*Pounds.*	*Per cent.*	*Barrels.*
1790				650	200	30.8					
1791				2,250							
1793				98,712							
1794				84,965							
1795				76,634							65,000
1796				1,000							
1797				5,848							
1798				18,336							
1799				100							
1800				70,784							
1801				60,866							
1802				915,473	90,000	9.8					
1803				385,886	55,000	14.3					
1804				134,606	13,000	9.7					
1805				946,827	95,000	10.0					
1806				20,492	3,000	14.6					
1807				20,697	3,000	14.5					
1808				5,963	1,000	16.8					
1809				4,460	500	11.2					
1810											185,637
1811				55,313	7,000	12.7					
1815				16,533	4,000	24.2					
1816				3,735	934	25.0					
1817				474,396	175,527	37.0					
1818				81,430	20,358	25.0					
1819				142,316	12,806	9.0					
1820				319,501	18,498	5.8					
1821				283,200	23,025	8.1					
1822				249,927	27,124	10.9					
1823				389,788	81,810	21.0					

HOPS—Continued.

Production, value, domestic exports, imports, and consumption of hops for the United States, 1790–1909—Continued.

Year.	Production.	Farm value.		Fiscal year beginning in year mentioned.					Retained and received for consumption.		Beer brewed, U. S. barrels of 31 gallons.
				Domestic exports.			Imports for consumption.				
		Total.	Per pound.	Net weight.	Value. Total.	Value. Per pound.	Net weight.	Total value.	Net weight.	Percentage of production.	
	Pounds.	*Dollars.*	*Cents.*	*Pounds.*	*Dollars.*	*Cents.*	*Pounds.*	*Dollars.*	*Pounds.*	*Per cent.*	*Barrels.*
1824				117,623	13,865	11.8					
1825				388,718	100,668	25.9					
1826				88,460	8,284	9.4					
1827				375,058	25,432	6.8					
1828				128,482	6,917	5.4					
1829				383,060	30,312	7.9					
1830				265,043	26,664	10.1					
1831				184,729	25,448	13.8					
1832				468,798	92,963	19.8					
1833				917,600	164,577	17.9					
1834				625,684	90,720	14.5					
1835				207,548	25,886	12.5					
1836				1,096,428	89,705	8.2					
1837				854,106	53,602	6.3					
1838				747,164	72,425	9.7					
1839	1,238,502			82,086	11,235	13.7			1,156,416	93.4	750,572
1840				176,619	28,823	16.3					
1841				339,181	35,547	10.5					
1842				1,182,565	123,745	10.5					
1843				664,363	51,550	7.8					
1844	1,863,000			902,072	90,341	10.0			960,928	51.6	
1845	1,485,000			287,754	41,692	14.5			1,197,246	80.6	
1846				1,227,453	150,654	12.3					
1847	1,510,972	151,097	10.0	257,016	17,671	6.9			1,253,956	83.0	
1848				411,164	29,123	7.1					
1849	3,497,029	1,223,960	35.0	1,275,455	142,692	11.2			2,221,574	63.5	1,179,495
1850				110,360	11,636	10.5					
1851				238,008	69,042	29.0					
1852				245,647	40,054	16.3					
1853	3,000,000	450,000	15.0	260,026	63,763	24.5			2,739,974	91.3	
1854				4,021,816	1,310,720	32.6					
1855				1,048,515	146,966	14.0					

1856				924,538	84,852	9.2					
1857				458,889	41,704	9.1					
1858				587,953	53,016	9.1					
1859	10,991,996			273,257	32,866	12.0			10,718,.37	97.5	3,235,545
1860				8,835,837	2,006,053	22.7					
1861				4,860,046	653,968	13.5					
1862	16,000,000			8,864,081	1,265,522	14.3			7,135,919	44.6	2,008,625
1863	13,000,000			5,851,165	780,347	13.3			7,148,835	55.0	3,141,381
1864	13,000,000			3,671,371	673,214	18.3			9,328,629	71.8	3,657,181
1865				349,987	77,431	22.1	1,808,610	456,731			5,115,142
1866				1,001,603	258,832	25.8	725,509	213,388			6,207,400
1867				532,038	190,802	35.9	3,270,998	859,316			6,146,663
1868				11,269,555	1,185,197	10.5	280,111	55,154			6,342,055
1869	25,456,669			16,356,231	2,041,216	12.5	21,568	2,966	9,122,006	35.8	6,574,617
1870				3,273,653	281,469	8.6	100,884	12,811			7,740,280
1871				3,061,244	365,765	11.9	1,999,458	785,535			8,659,427
1872				1,795,437	238,932	13.3	5,608,902	1,310,627			9,633,323
1873				117,358	25,188	21.5	4,337,886	1,303,637			9,600,897
1874				3,066,703	1,143,165	37.2	117,013	51,746			9,452,697
1875				9,191,589	1,223,681	13.3	83,243	25,628			9,902,352
1876				9,581,108	2,139,662	22.3	20,177	10,393			9,810,060
1877	39,000,000			18,458,782	2,102,453	11.4	52,878	17,173	20,594,096	52.8	10,241,471
1878				5,458,159	699,767	12.8	112,537	35,494			11,103,064
1879	26,546,378			9,739,566	2,573,292	26.4	357,273	151,792	15,164,085	57.1	13,347,111
1880				8,990,855	2,016,970	22.4	475,428	111,900			14,311,028
1881				5,867,363	1,456,786	24.8	874,558	288,344			16,952,085
1882				7,817,228	5,616,370	71.8	1,977,715	1,490,026			17,757,892
1883				13,516,643	3,265,211	24.2	696,897	303,260			18,998,619
1884				7,055,289	1,391,854	19.7	1,638,428	435,106			19,185,953
1885				13,665,661	1,714,488	12.5	2,723,971	440,217			20,710,933
1886				260,721	54,970	21.1	16,615,829	3,117,663			23,121,526
1887				6,793,818	1,203,060	17.7	5,849,270	1,053,233			24,680,219
1888				12,589,262	2,823,832	22.4	4,090,580	1,100,408			25,119,853
1889	39,171,270	4,059,697	10.4	7,540,854	1,110,571	14.7	6,446,973	1,069,696	38,077,389	97.2	27,661,944
1890	34,500,000			8,736,080	2,327,474	26.6	3,759,264	1,706,824	29,613,154	85.7	30,497,209
1891	37,440,000			12,604,666	2,420,502	19.3	2,397,547	839,295	27,232,861	72.7	31,856,626
1892	40,140,000			11,367,030	2,695,867	23.7	2,657,366	1,100,878	31,430,336	78.3	34,591,179
1893	48,240,000			17,472,975	3,844,232	22.0	821,482	471,597	31,588,507	65.5	33,362,373
1894	57,600,000			17,523,388	1,872,597	10.7	3,027,192	587,866	43,103,804	74.8	33,589,784
1895	52,560,000			16,765,254	1,478,919	8.8	2,736,757	610,839	38,531,503	73.3	35,859,260
1896	31,500,000	1,795,500	5.7	11,426,241	1,304,183	11.4	2,993,514	627,808	23,067,573	73.2	34,462,822
1897	40,500,000	3,766,500	9.3	17,161,609	2,642,779	15.4	2,322,019	636,353	25,660,350	63.4	37,529,339
1898	38,610,000	5,019,300	13.0	21,145,512	3,626,144	17.1	1,334,056	578,834	18,798,544	48.7	36,697,634
1899	49,209,704	4,081,929	8.2	12,639,474	1,707,660	13.5	2,557,318	712,016	39,127,548	79.5	39,471,598
1900	37,440,000	4,492,800	12.0	14,963,676	2,466,515	16.5	2,489,069	827,944	24,965,393	66.7	40,614,258
1901	38,800,000	4,772,400	12.3	10,715,151	1,550,657	14.5	2,894,454	855,735	30,979,303	79.8	44,550,127
1902	38,900,000	8,908,100	22.9	7,794,705	1,909,961	24.5	5,999,937	1,771,046	37,105,232	95.4	46,720,179
1903	44,295,000	10,144,000	22.9	10,985,988	2,116,180	19.3	2,770,552	1,369,329	36,079,564	81.5	46,265,168

HOPS—Continued.

Production, value, domestic exports, imports, and consumption of hops for the United States, 1790–1909—Continued.

Year.	Production.	Farm value.		Fiscal year beginning in year mentioned.					Retained and received for consumption.		Beer brewed, U. S. barrels of 31 gallons.
				Domestic exports.			Imports for consumption.				
		Total.	Per pound.	Net weight.	Value. Total.	Value. Per pound.	Net weight.	Total value.	Net weight.	Percentage of production.	
	Pounds.	*Dollars.*	*Cents.*	*Pounds.*	*Dollars.*	*Cents.*	*Pounds.*	*Dollars.*	*Pounds.*	*Per cent.*	*Barrels.*
1904	49,125,000	13,362,000	27.2	14,858,612	4,480,660	30.2	4,321,491	1,969,308	38,587,879	78.6	49,522,029
1905	55,536,000	8,275,000	14.9	13,026,904	3,125,843	24.0	9,630,206	2,266,333	52,139,302	93.9	54,724,553
1906	60,286,000	6,873,000	11.4	16,809,534	3,531,972	21.0	5,733,386	1,813,306	49,209,852	81.6	58,622,002
1907	54,000,000	5,346,000	9.9	22,920,480	2,963,167	12.9	8,636,192	1,911,602	39,715,712	73.5	58,814,033
1908	39,000,000	4,251,000	10.9	10,446,884	1,271,629	12.2	7,383,907	1,335,300	35,937,023	92.1	56,303,497
1909	36,000,000	7,992,000	22.2								
Average:											
1796–1800				19,214							
1801–1805				488,732							
1816–1820				204,276	45,625	20.4					
1821–1825				285,851	49,298	15.5					
1826–1830				248,021	19,522	7.9					
1831–1835				480,872	79,919	15.7					
1836–1840				591,281	51,158	10.8					
1841–1845				675,187	68,575	10.7					
1846–1850				656,290	70,355	9.6					
1851–1855				1,162,802	326,109	23.3					
1856–1860				2,216,095	443,698	12.4					
1861–1865				4,719,330	690,096	16.3					
1866–1870				6,486,616	791,503	18.7	879,814	228,727			6,602,199
1871–1875				3,446,466	599,346	19.4	2,429,300	695,435			9,449,739
1876–1880				10,445,654	1,906,429	19.1	203,659	65,351			11,762,551
1881–1885				9,584,437	2,688,942	30.6	1,582,314	591,391			18,721,096
1886–1890				7,184,147	1,503,981	20.5	7,356,983	1,607,565			26,196,150
1891–1895	47,196,000			15,146,667	2,462,423	16.9	2,328,069	722,095	34,377,402	72.8	33,851,842
1896–1900	39,451,941	3,831,206	9.6	15,467,314	2,349,456	14.8	2,339,255	676,597	26,323,882	66.7	37,755,129
1901–1905	45,331,200	9,092,300	20.0	11,476,272	2,636,659	22.5	5,123,328	1,646,350	38,978,256	86.0	48,756,411

HOPS—Continued.

Wholesale prices of hops per pound, 1896–1909.

Date.	New York. Choice State. Low.	New York. Choice State. High.	Cincinnati. Choice. Low.	Cincinnati. Choice. High	Chicago. Pacific coast, good to choice.[a] Low	Chicago. Pacific coast, good to choice.[a] High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1896........	7	15	6	15	4	14
1897........	7	18	8	18	6	17
1898........	11	20	14	20	5	19½
1899........	12	18	13	19	7	18
1900........	12½	21	10	18	6½	18
1901........	13	20	13¾	17$\frac{9}{16}$	12½	19
1902........	14	38	14½	30	12½	31
1903........	20½	37	24	29½	19	31
1904........	32	41	28	37	28½	37
1905........	13	37	13½	33	10	34
1906.						
January....	15	19	13	14½	12	14
February..	14	17	13	14½	10	14
March......	13	16	12	14	9	14
April.......	12	15	12	17	10	17
May........	11	15	12	15	9	15
June........	11	14	12	15	9	14
July........	12	17	12	17½	10	17
August.....	15	17	17	18	12	18
September..	15	17	14	18	12	22
October....	22	25	17	18	14	18
November..	23	25	17½	18½	13	18
December..	21	24	17½	18½	12	18
Year..	11	25	12	18½	9	22
1907.			(b)		(c)	
January....	21	23	16½	......	12	18
February...	21	23	16½	......	12	17
March......	21	23	14½	......	10	15
April.......	15	20	13	......	8	12
May........	15	16	13	......	10	13
June........	15	16	14	......	8	12
July........	15	16	13½	......	7	11
August.....	14	16	12½	......	6	9
September .	12	15	12	......	10	13

Date.	New York. Choice State. Low	New York. Choice State. High.	Cincinnati. Prime. Low.	Cincinnati. Prime. High.	Chicago. Prime to choice. Low.	Chicago. Prime to choice. High.
1907.	*Cents.*	*Cents.*	*Cents.*	*Cents*	*Cents.*	*Cents.*
October....	12	18	12	....	9	13
November..	16	18	12	...	8	12
December..	16	17	12	...	8	11
Year .	12	23	12	...	6	18
1908.					(d)	
January...	15	16	10	.....	8	11
February...	13	16	9½	.....	6	10
March...	11	14	9	.....	6	9
April.	11	12	8½	.....	6	8
May ..	11	12	8½	.....	6	10
June.	9	12	8½	.....	6	10
July.	7	11	8½	.....	5	9
August...	6	8	8	.....	5	8
September .	6	7	8	.....	9	11
October....	13	14	12	.....	9	11
November..	13	14	11	.....	9	11
December..	12	14	11	.....	9	11
Year .	6	16	8	....	5	11
1909.			(e)			
January...	12	14	10	.....	10	11
February..	12	15	10	.....	10	11
March......	13	15	11	.....	10	11½
April....	13	15	11	.....	9	11
May......	13	14	11	.....	10	12
June.......	13	17	13	.....	13	15
July..	15	19	14	15	13	15
August ..	18	19	16	17	10	18
September .	18	19	20	22	25	28
October....	33	39	28	.....	25	29
November..	34	39	28	.....	24	28
December..	33	36	27	28	23	27
Year..	12	39	10	28	9	29

a Common to choice, 1896 to 1903.
b Prime.
c Prime to choice.
d Pacific coast, good to choice.
e Choice.

HOPS—Continued.

International trade in hops, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Austria-Hungary	Jan. 1	10,037,424	18,777,206	12,365,284	17,826,133	15,498,272
Belgium	Jan. 1	9,665,294	2,582,318	3,178,692	2,166,826	1,403,039
France	Jan. 1	784,610	606,364	382,722	386,691	152,339
Germany [b]	Jan. 1	24,358,207	22,855,096	26,767,198	22,540,055	27,341,943
Netherlands	Jan. 1	2,104,063	1,256,969	1,534,058	1,561,238	1,771,166
New Zealand	Jan. 1	644,336	369,712	493,360	288,176	170,016
Russia	Jan. 1	1,117,294	1,140,117	1,978,368	681,990	[c] 144,451
United Kingdom	Jan. 1	1,554,336	1,820,448	1,300,096	1,168,720	1,059,632
United States	Jan. 1	17,777,608	5,713,662	17,701,436	16,090,959	21,423,869
Other countries		138,335	63,125	140,828	258,296	[c] 95,224
Total		68,181,507	55,185,057	65,842,042	62,969,084	69,059,941

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Australia	Jan. 1	913,830	1,279,362	1,412,569	1,020,898	973,814
Austria-Hungary	Jan. 1	2,109,162	1,187,189	1,346,363	773,602	553,360
Belgium	Jan. 1	4,826,301	6,617,221	5,431,355	5,677,912	6,025,351
British India	Jan. 1	488,432	485,184	307,216	470,736	363,888
British South Africa [d]	Jan. 1	487,424	308,112	657,888	588,672	543,984
Canada	Jan. 1	842,973	964,962	699,630	1,223,478	1,205,845
Denmark	Jan. 1	1,359,149	1,378,660	1,297,861	1,293,011	1,340,961
France	Jan. 1	4,428,343	3,879,328	4,386,095	4,297,911	4,907,929
Germany [b]	Jan. 1	5,346,208	9,047,989	4,865,380	6,666,336	6,154,864
Netherlands	Jan. 1	4,020,148	3,368,742	3,497,750	3,372,957	3,386,709
Russia	Jan. 1	1,363,547	1,199,162	1,452,240	1,395,110	[c] 1,191,722
Sweden	Jan. 1	1,298,174	1,662,563	1,275,477	1,488,832	1,166,003
Switzerland	Jan. 1	1,168,891	1,347,685	1,087,540	1,421,540	1,289,704
United Kingdom	Jan. 1	34,437,312	11,147,584	25,702,992	21,902,048	29,922,256
United States	Jan. 1	4,736,488	5,968,533	7,849,548	7,163,356	7,369,684
Other countries		2,454,058	2,514,950	4,107,343	3,465,556	[c] 3,808,047
Total		*70,280,440*	*52,357,226*	*65,377,247*	*62,121,955*	*70,204,121*

[a] See "General note," p. 442.
[b] Not including free ports prior to March 1, 1906.
[c] Preliminary.
[d] Cape Colony before 1906.

BEANS.

Wholesale prices of beans per bushel, 1897-1909.

Date.	Boston.		Cincinnati.		Chicago.		Detroit.		San Francisco.	
	Pea		Navy.		Pea.		Pea.		Small white (per cwt.).	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1897	....	....	$0.70	$1.20	$0.35	$1.25	$0.60	$1.05	....	....
1898	....	....	1.10	1.55	.78	1.30	.90	1.30	$1.25	$2.20
1899	....	....	1.05	1.75	.90	1.87	1.01	1.80	2.00	3.00
1900	....	....	2.00	2.55	1.65	2.25	1.55	2.10	2.85	4.50
1901	$2.00	$2.75	2.40	3.00	.90	2.80	1.60	2.40	2.00	5.00
1902	1.60	2.55	2.20	2.70	.85	2.49	1.28	1.98	3.30	4.65
1903	2.10	2.45	2.05	2.50	.90	2.49	1.82	2.35	2.40	3.40
1904	1.72½	2.20	1.80	2.10	.90	2.05	1.58	1.98	2.75	3.32½
1905	1.75	2.00	1.65	1.90	1.00	1.85	1.49	1.85	2.75	3.60
1906.										
January	1.75	1.80	1.65	1.75	1.40	1.62	1.55	1.61	....	....
February	1.65	1.75	1.65	1.75	1.37	1.58	1.45	1.55	....	....
March	1.55	1.60	1.65	1.75	1.35	1.55	1.40	1.47	....	....
April	1.60	1.65	1.65	1.75	1.10	1.62	1.44	1.52	....	....
May	1.60	1.70	1.65	1.75	1.20	1.62	1.48	1.54	....	....
June	1.60	1.72	1.65	1.75	1.25	1.66	1.48	1.55	....	....
July	1.60	1.62	1.65	1.75	1.25	1.64	1.50	1.52	....	....
August	1.55	1.60	1.65	1.75	1.25	1.58	1.41	1.50	....	....
September	1.50	1.55	1.65	1.75	1.39	1.53	1.30	1.44	....	....
October	1.55	1.65	1.65	1.75	1.40	1.48	1.37	1.40	....	....
November	1.60	1.65	1.65	1.75	1.40	1.46	1.34	1.37	....	....
December	1.50	1.55	1.65	1.75	1.35	1.45	1.27	1.30	....	....
Year	1.50	1.80	1.65	1.75	1.10	1.65	1.27	1.61	....	....
1907.					(a)					
January	1.50	1.50	1.65	1.75	1.20	1.38	1.28	1.31	2.60	2.95
February	1.50	1.55	1.65	1.70	1.10	1.39	1.31	1.36	2.60	3.00
March	1.45	1.55	1.65	1.70	1.10	1.36	1.30	1.36	2.75	3.00
April	1.42	1.47	1.65	1.75	1.10	1.35	1.32	1.36	2.85	3.10
May	1.45	1.90	1.65	1.75	1.10	1.77	1.38	1.73	2.80	3.05
June	1.80	1.90	1.65	1.75	1.55	1.83	1.64	1.74	2.80	3.00
July	1.70	1.75	1.65	1.70	1.15	1.68	1.50	1.65	2.75	3.00
August	1.70	1.80	1.65	1.70	1.15	1.85	1.48	1.60	2.85	3.00
September	1.90	2.25	1.65	1.70	1.35	2.25	1.75	2.06	2.85	3.15
October	2.35	2.45	1.65	1.70	1.85	2.40	2.00	2.25	3.00	3.60
November	2.45	2.45	1.65	2.25	1.85	2.65	1.90	2.10	3.40	3.60
December	2.30	2.40	2.00	2.25	1.85	2.15	1.90	2.00	3.40	3.55
Year	1.42	2.45	1.65	2.25	1.10	2.65	1.28	2.26	2.60	3.60
1908.					(b)					
January	2.30	2.35	2.00	2.25	1.85	2.15	2.00	2.10	3.40	3.55
February	2.35	2.40	2.00	2.25	1.75	2.40	2.10	2.30	3.40	3.60
March	2.30	2.40	2.26	2.40	1.80	2.40	2.10	2.25	3.40	3.60
April	2.35	2.45	2.30	2.40	1.65	2.32	2.25	2.42	3.40	3.60
May	2.60	2.75	2.30	2.40	1.65	2.70	2.42	2.55	3.50	4.35
June	2.65	2.75	2.30	2.40	2.00	2.70	2.47	2.60	4.20	4.50
July	2.65	2.70	2.30	2.40	2.00	2.65	2.40	2.65	4.35	4.60
August	2.60	2.70	2.30	2.40	1.90	2.54	2.50	2.65	4.60	4.75
September	2.35	2.60	2.30	2.40	1.75	2.40	2.05	2.40	4.25	4.75
October	2.35	2.40	2.30	2.40	1.75	2.40	2.10	2.18	4.00	4.50
November	2.40	2.40	2.30	2.40	1.75	2.25	2.10	2.20	4.30	4.65
December	2.35	2.40	2.30	2.40	1.75	2.27	2.15	2.15	4.33	4.70
Year	2.30	2.75	2.00	2.40	1.65	2.70	2.00	2.65	3.40	4.75
1909.					(a)					
January	2.35	2.45	2.30	2.40	1.75	2.33	2.15	2.30	4.50	4.90
February	2.45	2.55	2.30	2.40	1.80	2.50	2.25	2.40	5.10	5.30
March	2.55	2.55	2.30	2.40	2.20	2.48	2.35	2.40	5.20	5.40
April	2.50	2.55	2.30	2.40	2.25	2.58	2.36	2.50	5.35	5.65
May	2.55	2.75	2.40	2.75	2.35	2.65	2.50	2.55	5.50	6.00
June	2.70	2.75	2.60	2.75	2.50	2.67	2.50	2.55	6.00	7.00
July	2.70	2.75	2.60	2.75	2.12½	2.67	2.20	2.50	6.25	7.00
August	2.60	2.70	2.60	2.75	2.12½	2.20	2.15	2.20	6.75	7.50
September	2.35	2.50	2.60	2.75	2.12½	2.36	2.10	2.20	4.00	4.50
October	2.30	2.40	2.60	2.75	2.00	2.36	2.00	2.10	4.00	4.65
November	2.25	2.35	2.60	2.75	1.96	2.25	2.00	2.10	4.50	5.00
December	2.25	2.30	2.60	2.75	2.03	2.17	2.55	2.55	4.50	5.00
Year	2.25	2.75	2.30	2.75	1.75	2.67	2.00	2.55	4.00	7.50

a Common to fine.

b Pea.

SUGAR.

Sugar production of countries named, 1905–6 to 1909–10.

[European beet sugar, as estimated by Licht; United States beet sugar, from reports of Department of Agriculture on the Progress of the Beet-Sugar Industry in the United States; production of British India, except 1909–10, from official statistics; other data, from Willett & Gray. The estimates of Willett & Gray do not include the production of China and some other less important sugar-producing countries.]

Country.	1905–6.	1906–7.	1907–8.	1908–9.	1909–10.
CANE SUGAR.					
NORTH AMERICA.					
United States:					
Contiguous—	*Tons.*[a]	*Tons.*[a]	*Tons.*[a]	*Tons.*[a]	*Tons.*[a]
Louisiana	336,752	230,000	340,000	355,000	325,000
Texas	12,000	13,000	12,000	15,000	10,000
Noncontiguous—					
Hawaii	383,225	392,871	465,288	477,817	490,000
Porto Rico	213,000	210,000	200,000	245,000	280,000
Total United States (except Philippine Islands)	944,977	845,871	1,017,288	1,092,817	1,105,000
Central America:					
Costa Rica	1,377	2,365	2,415	2,500	2,500
Guatemala	6,795	7,469	7,178	7,500	7,500
Nicaragua	4,400	3,905	4,175	4,500	4,500
Salvador	5,944	6,008	5,490	6,500	6,500
Mexico	107,529	119,496	123,285	125,000	130,000
West Indies:					
British—					
Antigua and St. Kitts	24,000	28,319	20,000	24,000	25,000
Barbados [b]	49,864	32,950	31,852	13,128	40,000
Jamaica [b]	12,523	13,971	10,718	11,453	12,000
Trinidad [b]	56,455	45,031	41,626	44,512	45,000
Cuba	*1,178,749*	*1,427,673*	961,958	*1,513,582*	*1,700,000*
Danish—St. Croix	13,000	13,000	13,000	14,000	15,000
French—					
Guadeloupe	36,000	38,960	37,500	25,211	43,000
Martinique [b]	42,231	36,764	35,943	37,757	40,000
Haiti and Santo Domingo	55,090	60,000	60,000	80,000	90,000
Other	*13,000*	*5,662*	*5,000*	*6,000*	*6,000*
Total	2,551,934	2,688,044	2,377,428	3,008,460	3,272,000
SOUTH AMERICA.					
Argentina	*137,308*	*116,287*	*109,445*	*162,479*	*125,000*
Brazil	275,000	215,000	180,000	248,000	276,000
British Guiana [b]	121,693	120,334	99,737	117,176	115,000
Dutch Guiana	13,000	13,000	13,000	14,000	15,000
Peru	150,000	161,156	135,336	150,000	150,000
Venezuela	3,000	3,000	3,000	3,000	3,000
Total	700,001	628,777	540,518	694,655	684,000
EUROPE.					
Spain	15,722	16,400	11,000	20,000	16,000
ASIA.					
British India [c]	1,725,500	2,205,300	2,046,900	1,841,800	1,800,000
Formosa	64,190	81,448	68,450	120,000	130,000
Java	990,994	1,011,546	1,156,477	1,241,885	1,186,000
Philippine Islands [d]	145,525	145,500	150,000	150,000	145,000
Total	2,926,209	3,443,794	3,421,827	3,353,685	3,260,000
AFRICA.					
Egypt	65,000	42,106	55,648	55,000	55,000
Mauritius	188,364	220,000	170,000	195,000	230,000
Natal	26,603	27,130	24,223	31,992	65,000
Réunion	38,000	37,500	35,000	37,000	45,000
Total	317,967	326,825	284,870	318,992	395,000

[a] Tons of 2,240 pounds, except beet sugar in Europe, which is shown in metric tons of 2,204.622 pounds.
[b] Exports.
[c] Official estimates for such parts of British India as return statistics of production.
[d] After 1907–8, exports.

SUGAR—Continued.

Sugar production of countries named, 1905–6 to 1909–10—Continued.

Country.	1905–6.	1906–7.	1907–8.	1907–9.	1909–10.
OCEANIA.					
Australia:	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Queensland	170,000	182,000	188,307	151,098	133,578
New South Wales	20,000	24,000	23,418	15,000	14,750
Fiji [a]	40,000	43,000	69,000	65,000	69,000
Total	230,000	249,000	280,725	231,098	217,328
Grand total, cane sugar	6,741,833	7,352,840	6,916,368	7,626,890	7,844,328
BEET SUGAR.					
NORTH AMERICA.					
United States	279,393	431,796	413,954	380,254	457,562
Canada	11,419	11,367	7,943	6,964	8,802
Total	290,812	443,163	421,897	387,218	466,364
EUROPE.					
Austria-Hungary	1,509,789	1,343,940	1,424,657	1,398,000	1,260,000
Belgium	328,770	282,804	232,352	258,000	250,000
France	1,089,684	756,094	727,712	802,000	825,000
Germany	2,418,156	2,239,179	2,129,597	2,080,000	2,040,000
Netherlands	207,189	181,417	175,184	214,000	200,000
Russia	968,500	1,440,130	1,410,000	1,265,000	1,150,000
Other countries	410,255	467,244	462,772	500,000	460,000
Total	6,932,343	6,710,808	6,562,274	6,517,000	6,185,000
Grand total, beet sugar	7,223,155	7,153,971	6,984,171	6,904,218	6,651,364
Grand total, cane and beet sugar	13,964,988	14,506,811	13,900,539	14,531,108	14,495,692

[a] Exports.

Production of sugar in the United States and its possessions, 1839–40 to 1909–10.

[Census data, as far as available, are given in *italics*. Census of 1840 did not separate cane and maple sugar; *statistics for "Other Southern States" represent production of all sugar in South Carolina, Georgia,* Florida, Tennessee, Alabama, and Mississippi. Censuses of 1850 and 1860 give returns in "Hogsheads of *1,000 pounds" and Censuses of 1870 and 1880 in "Hogsheads;" these returns were converted into pounds,* in Census Abstract of 1890 at rate of 1,200 pounds to the hogshead and in Census of 1900 at rate of 1,000 pounds. Beet-sugar production for 1897–98 from Special Report of Department of Agriculture; for 1901–2 and later years from Progress of the Beet-Sugar Industry in the United States; for other years from Willett & Gray. Production of cane sugar in Louisiana beginning 1906–7, and in Texas beginning 1903–4, from Willett & Gray; earlier statistics for Louisiana and other Southern States from Bouchereau, in part taken directly from his reports and in part from the Statistical Abstract of the United States. Porto Rican production of cane sugar for 1854–55 to 1884–85 from Rueb & Co.; for later years from Willett & Gray. Statistics for Hawaii, 1874–75 to 1880–81, represent exports, from Bureau of Statistics Bul. 30; for 1881–82 to 1884–85 from Rueb & Co.; for later years from Willett & Gray. Statistics for Philippine Islands for 1854–55 to 1857–58, 1859–60 to 1866–67, 1872–73 to 1894–95 represent exports as officially returned, taken from the Census of the Philippine Islands, 1903; for 1858–59, 1867–68 to 1871–72 from Foreign Markets Bul. 14, representing commercial estimates of exports; subsequently from Willett & Gray, the statistics for 1904–5 to 1907–8 representing production, other years, production. Tons of 2,240 pounds throughout.]

Year.	Beet sugar.	Cane sugar.					Total.
		Louisiana.	Other Southern States.	Porto Rico.	Hawaii.	Philippine Islands.	
	Long tons.	*Long tons.*	*Long tons.*	*Long tons.*	*Long tons.*	*Long tons.*	*Long tons.*
1839–40 (Census)		*53,548*	*405*				
		Hogsheads.	*Hogsheads.*				
1849–50 (Census)		*226,001*	*21,576*				
		Long tons.	*Long tons.*				
1854–55		171,976	13,169	58,377		35,008	278,530
1855–56		113,647	9,821	82,000		47,397	252,865
1856–57		36,327	2,673	85,000		36,066	160,066
1857–58		137,351	6,385	69,444		26,858	240,038
1858–59		186,177	8,169	58,000		59,095	301,441
1859–60		113,891	5,149	57,000		49,013	225,053
		Hogsheads.	*Hogsheads.*				
1859–60 (Census)		*231,726*	*9,256*				

SUGAR—Continued.

Production of sugar in the United States and its possessions, 1839-40 to 1909-10—Con.

Year.	Beet sugar.	Cane sugar.					Total.
		Louisiana.	Other Southern States.	Porto Rico.	Hawaii.	Philippine Islands.	
	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.	Long tons.
1860-61	....	118,332	4,313	67,000	....	45,316	234,961
1861-62	....	235,858	5,138	68,000	....	60,957	369,953
1862-63	....	43,232	2,768	63,000	....	51,240	160,240
1863-64		37,723	250	61,590	....	44,325	144,288
1864-65		4,821	179	63,375	....	46,092	114,867
1865-66		8,884	348	64,417	....	40,635	114,685
1866-67		19,152	3,348	68,229	....	55,195	146,324
1867-68		18,482	4,518	73,935	....	74,081	171,416
1868-69	a 400	42,434	2,567	81,500	....	68,818	195,719
1869-70		44,399	2,402	102,110	....	78,214	227,525
		Hogsheads.	Hogsheads.				
1869-70 (Census)		80,706	6,337	....	....	....	....
		Long tons.	Long tons.				
1870-71		75,392	4,208	103,304	....	87,465	270,769
1871-72		65,583	4,217	89,559	....	95,526	255,285
1872-73	500	55,958	4,235	87,639	....	83,865	232,197
1873-74	700	46,090	2,410	71,755	....	99,770	220,725
1874-75		60,047	3,454	72,128	11,197	126,089	273,015
1875-76	b 100	72,954	4,046	70,016	11,639	128,485	287,240
1876-77		85,122	3,879	62,340	11,418	121,052	283,911
1877-78		65,671	5,330	84,347	17,157	120,096	292,701
1878-79	200	106,910	5,090	76,411	21,884	129,777	340,272
1879-80	1,200	88,822	3,980	57,057	28,386	178,329	357,774
		Hogsheads.	Hogsheads.				
1879-80 (Census)	....	171,706	7,166	....	....	....	....
		Long tons.	Long tons.				
1880-81	500	121,867	5,500	61,715	41,870	205,508	436,960
1881-82	b 500	71,373	5,000	80,066	50,972	148,047	355,958
1882-83		135,297	7,000	77,632	51,705	193,726	465,860
1883-84	535	128,443	6,800	98,665	63,948	120,199	418,590
1884-85	953	94,376	6,500	70,000	76,496	200,997	449,322
1885-86	600	127,958	7,200	64,000	96,500	182,019	478,277
1886-87	800	80,859	4,535	86,000	95,000	169,040	436,234
1887-88	255	157,971	9,843	60,000	100,000	158,445	486,514
1888-89	1,861	144,878	9,031	62,000	120,000	224,861	562,631
1889-90	2,203	128,344	8,159	55,000	120,000	142,554	456,260
1889-90 (Census)	....	130,413	4,089	....	....	....	....
1890-91	3,459	215,844	6,107	50,000	125,000	136,035	536,445
1891-92	5,356	160,937	4,500	70,000	115,598	248,806	605,197
1892-93	12,018	217,525	5,000	50,000	140,000	257,392	681,935
1893-94	19,950	265,836	6,854	60,000	136,689	207,319	696,648
1894-95	20,092	317,334	8,288	52,500	131,698	336,076	865,988
1895-96	29,220	237,721	4,973	50,000	201,632	230,000	753,546
1896-97	37,536	282,009	5,570	58,000	224,218	202,000	809,333
1897-98	40,398	310,447	5,737	54,000	204,833	178,000	793,415
1898-99	32,471	245,512	3,442	53,826	252,507	93,000	680,758
1898-99 (Census)	....	248,658	c 5,266	....	....	....	....
1899-1900	72,944	147,164	2,027	35,000	258,521	62,785	578,441
1899-1900 (Census)	72,972	142,485	1,510	....	242,008	....	....
1900-1901	76,859	275,579	2,891	80,000	321,461	55,400	812,190
1901-2	164,827	321,676	3,614	85,000	317,509	78,637	971,263
1902-3	195,005	329,227	3,722	85,000	391,062	90,000	1,094,016
1902 (Census)	....	....	....	....	....	177,371	....
1903-4	214,825	228,477	c 19,800	130,000	328,103	84,000	1,005,205
1904-5	216,173	355,531	c 15,000	145,000	380,576	106,875	1,219,155
1904-5 (Census)	228,715	....	....	....	....	....	....
1905-6	279,393	336,752	c 12,000	213,000	383,225	145,525	1,369,895
1906-7	431,796	230,000	c 13,000	210,000	392,871	145,500	1,423,167
1907-8	413,954	340,000	c 12,000	200,000	465,288	150,000	1,581,242
1908-9	380,254	355,000	c 15,000	245,000	477,817	150,000	1,623,071
1909-10	457,562	325,000	c 10,000	280,000	490,000	145,000	1,707,562

a Mean annual production; quantity varied from year to year between 300 and 500 tons.
b Production uncertain; not exceeding quantity stated.
c Texas.

SUGAR—Continued.

International trade in sugar, 1904-1908. [a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907	1908.
		Pounds.	*Pounds.*	*Pounds*	*Pounds*	*Pounds.*
Argentina	Jan. 1	40,368,833	4,847,964	233,690	140,653	40,022
Austria-Hungary	Jan. 1	1,125,102,823	1,265,791,878	1,631,945,421	1,618,876,642	1,766,020,563
Belgium	Jan. 1	406,944,665	304,193,682	462,976,753	381,085,086	293,991,033
Brazil	Jan. 1	17,331,526	83,216,786	7,278,902	28,346,807	69,616,811
British Guiana	Apr. 1	239,043,840	261,072,000	257,490,240	225,650,880	258,076,112
British India	Jan. 1	50,817,088	60,302,704	46,609,920	46,583,376	46,355,008
China	Jan. 1	48,787,467	69,228,800	59,815,600	47,729,733	75,628,933
Cuba	Jan. 1	2,459,166,945	2,412,915,391	2,643,700,975	2,910,438,045	[b] 1,962,240,000
Dutch East Indies	Jan. 1	2,318,243,282	2,314,655,085	2,197,208,868	2,632,250,558	[b] 2,475,540,161
Egypt	Jan. 1	50,620,531	67,821,106	10,495,854	9,206,628	8,638,977
Formosa	Jan. 1	79,518,816	93,930,689	147,283,970	124,800,731	137,148,777
France	Jan. 1	636,360,461	658,062,149	617,793,487	731,268,080	540,824,641
Germany [c]	Jan. 1	1,720,574,091	1,636,803,746	2,671,855,698	2,015,279,142	1,842,130,114
Mauritius	Jan. 1	435,923,550	361,987,596	410,919,376	431,348,726	434,420,448
Netherlands	Jan. 1	403,476,558	215,001,603	380,050,106	299,971,063	339,798,814
Peru	Jan. 1	290,916,853	295,935,805	301,435,777	23,402,733	[d] 23,402,733
Philippine Islands	Jan. 1	191,917,567	239,196,273	285,393,647	282,006,295	319,082,784
Réunion	Jan. 1	80,432,029	41,433,135	80,424,062	102,514,264	104,133,257
Russia	Jan. 1	398,854,898	220,925,074	214,041,360	396,915,568	[b] 623,956,958
Trinidad and Tobago	Apr. 1	106,573,936	81,179,056	100,809,856	103,645,472	88,744,320
Other countries		537,578,000	948,358,615	1,093,891,758	1,033,443,798	[b] 1,039,001,240
Total		11,638,553,768	11,636,859,137	13,601,658,410	13,444,913,280	12,448,998,306

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907	1908.
Argentina	Jan. 1	464,664	330,327	4,085,229	95,781,273	91,654,477
Australia	Jan. 1	85,198,624	55,923,056	94,026,128	13,891,096	43,814,064
British India	Jan. 1	776,046,880	666,139,936	1,222,706,352	1,073,977,072	1,185,089,896
British South Africa [e]	Jan. 1	101,468,941	82,805,094	112,856,109	106,466,060	91,486,806
Canada	Jan. 1	390,334,614	388,668,153	461,635,652	444,983,523	437,085,806
Chile	Jan. 1	124,139,619	75,610,563	118,266,828	124,648,777	[b] 105,497,181
China	Jan. 1	509,959,200	626,433,333	872,765,600	782,549,467	578,563,200
Denmark	Jan. 1	82,865,127	76,080,072	45,254,827	53,083,219	82,653,042
Egypt	Jan. 1	45,843,510	86,880,895	76,321,090	54,872,620	117,407,689
Finland	Jan. 1	71,263,531	73,772,007	83,322,752	87,685,848	90,250,437
France	Jan. 1	179,849,557	179,460,755	222,562,321	238,168,985	254,266,538
Italy	Jan. 1	4,928,873	11,251,729	31,832,317	52,332,870	10,795,373
Japan	Jan. 1	547,300,400	289,120,733	504,816,933	439,518,000	443,138,800
Netherlands	Jan. 1	208,329,129	167,742,700	121,994,196	196,542,746	141,159,438
New Zealand	Jan. 1	91,841,944	89,439,230	93,329,376	118,135,248	102,663,680
Norway	Jan. 1	76,703,054	77,993,596	80,364,138	87,092,424	87,074,147
Persia	Mar. 21	154,815,921	154,217,415	209,477,168	191,423,247	[d] 191,423,247
Portugal	Jan. 1	72,490,231	70,011,389	72,092,109	72,965,925	73,321,446
Singapore	Jan. 1	114,407,600	117,958,267	134,471,066	102,563,467	[d] 102,563,467
Switzerland	Jan. 1	175,444,701	192,011,994	187,653,456	205,551,900	201,421,100
Turkey	Mar. 14	[f] 273,612,826	[f] 273,612,826	302,621,963	[g] 302,621,963	[g] 302,621,963
United Kingdom	Jan. 1	3,409,501,648	3,099,597,648	3,420,616,976	3,535,722,624	3,495,191,616
United States	Jan. 1	4,137,696,178	3,737,336,660	3,873,665,661	3,872,221,493	3,718,700,706
Uruguay	July 1	49,814,318	33,838,445	47,969,665	[b] 3,904,846	[d] 3,904,846
Other countries		383,456,017	583,891,511	438,510,189	531,965,044	[b] 555,225,292
Total		12,067,777,107	11,210,137,334	12,833,018,110	12,788,670,343	12,506,974,037

[a] See "General note," p. 442.
[b] Preliminary.
[c] Not including free ports prior to March 1, 1906.
[d] Year preceding.
[e] Cape Colony before 1906.
[f] Imports for 1899.
[g] Imports for 1906.

Sugar-beet acreage and beet-sugar production in the United States, 1901 to 1909.

[From reports of Department of Agriculture on Progress of the Beet-Sugar Industry in the United States.]

State and year.	Factories in operation.	Area harvested.	Average yield of beets per acre.	Beets worked.	Sugar manufactured.	Average extraction of sugar based on weight of beets.	Average sugar in beets.	Average purity coefficient of beets.[a]	Average length of campaign.
		Acres.	*Tons.*[b]	*Tons.*[b]	*Pounds.*	*Per cent.*	*P. cent.*	*P. cent.*	*Days.*
California	10	83,000	10.63	882,084	254,544,000	14.43	17.61	83.62	102
Colorado	16	121,698	10.33	1,256,771	298,810,000	11.89	14.24	80.51	85
Idaho	3	15,434	10.60	163,557	39,988,000	12.22	15.98	86.17	83
Michigan	16	112,232	7.31	819,923	212,106,000	12.93	17.00	86.21	74
Utah	5	31,293	14.54	455,064	97,768,000	10.74	15.04	84.22	128
Wisconsin	4	14,000	10.21	143,000	34,340,000	12.01	15.88	85.17	63
States having but a single factory each:[c] Arizona Illinois Iowa Kansas Minnesota Montana Nebraska New York Ohio Oregon Washington	11	42,605	8.47	360,983	87,382,000	12.10	15.09	83.21	61
Totals and averages[d]	65	420,262	9.71	4,081,382	1,024,938,000	12.56	16.10	84.11	83
1908	62	364,913	9.36	3,414,891	851,768,000	12.47	15.74	83.5	74
1907	63	370,984	10.16	3,767,871	927,256,430	12.30	15.8	83.6	89
1906	63	376,074	11.26	4,236,112	967,224,000	11.42	14.9	82.2	105
1905	52	307,364	8.67	2,665,913	625,841,228	11.74	15.3	83.0	77
1904	48	197,784	10.47	2,071,539	484,226,430	11.69	15.3	83.1	78
1903	49	242,576	8.56	2,076,494	481,209,087	11.59	[e]15.1	([f])	75
1902	41	[g]216,400	8.76	1,895,812	436,811,685	11.52	[e]14.6	[e]83.3	94
1901	36	175,083	9.63	1,685,689	369,211,733	10.95	14.8	82.2	88

[a] By purity coefficient is meant the percentage of sugar in the total solids of the substance tested, whether it be beets, juice, or sugar. In this table it represents the average percentage of sugar in the total solids of the beets as determined by tests made at the factories.

[b] Tons of 2,000 pounds each.

[c] Grouped together to avoid giving publicity to data relating to individual factories.

[d] The average yield of beets per acre is found by dividing the total beets worked by the total acreage harvested; the average extraction of sugar by dividing the total sugar produced by the total beets worked; the average contents of sugar, coefficients of purity, and length of campaign by adding the figures reported by the different factories and dividing by the number of reporting factories.

[e] These averages are not based on data for all the factories, as some of them failed to report results of tests, but it it believed that they fairly represent the character of the total beet crops.

[f] No data reported.

[g] Based on reports from 27 factories and careful estimates for 14 others.

TEA.

International trade in tea, 1904–1908.[a]

EXPORTS.

Country.	Year beginning–	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
British India	Jan. 1	213,645,718	210,784,504	235,340,922	234,739,991	231,064,617
Ceylon	Jan. 1	157,929,342	170,183,558	170,527,126	179,843,462	177,960,902
China	Jan. 1	193,499,867	182,573,067	187,217,067	214,683,333	210,151,467
Dutch East Indies	Jan. 1	26,011,407	26,143,823	26,516,239	30,240,868	[b] 36,580,290
Formosa	Jan. 1	21,735,627	23,779,051	23,018,508	22,975,068	23,357,273
Japan	Jan. 1	47,108,802	38,505,730	39,036,497	40,589,420	35,209,050
Singapore	Jan. 1	2,752,933	2,411,600	2,396,667	2,521,333	[c] 2,521,333
Other countries		5,428,000	7,721,353	29,172,988	8,091,211	[b] 5,579,279
Total		668,111,696	662,102,686	713,826,014	733,084,686	722,494,211

IMPORTS.

Country.	Year beginning–	1904.	1905.	1906.	1907.	1908.
Argentina	Jan. 1	2,418,217	2,314,238	2,875,363	2,835,671	4,145,415
Australia	Jan. 1	28,688,974	28,353,903	29,478,614	35,174,152	29,873,772
Austria-Hungary	Jan. 1	2,662,742	2,755,998	2,859,615	3,090,439	3,105,431
British India	Jan. 1	5,584,103	6,009,868	5,426,731	5,905,738	7,598,859
British South Africa[d]	Jan. 1	3,322,815	3,254,208	4,823,363	4,613,177	4,613,065
Canada	Jan. 1	29,817,658	23,876,200	26,476,892	28,840,872	30,772,138
Chile	Jan. 1	1,760,302	2,496,479	2,904,127	2,380,893	[b] 2,294,187
Dutch East Indies	Jan. 1	4,044,820	4,962,110	5,113,929	5,443,220	[c] 5,443,220
France	Jan. 1	2,446,200	2,348,152	2,519,330	2,546,083	2,502,557
French Indo-China	Jan. 1	3,436,080	2,314,783	2,399,784	2,754,303	[c] 2,754,303
Germany[e]	Jan. 1	7,168,769	6,900,908	8,675,188	8,680,920	8,828,168
Netherlands	Jan. 1	8,794,208	9,090,607	9,559,206	9,202,811	10,234,107
New Zealand	Jan. 1	5,225,668	5,898,391	6,140,842	6,771,109	6,471,965
Persia	Mar. 21	5,784,277	6,997,776	5,410,358	9,782,414	[c] 9,782,414
Russia	Jan. 1	121,648,892	117,506,248	207,529,861	204,713,749	[b] 144,627,611
Singapore	Jan. 1	4,662,533	4,760,800	4,992,267	4,842,133	[c] 4,842,133
United Kingdom	Jan. 1	256,660,268	259,090,350	270,123,489	273,984,050	275,417,319
United States	Jan. 1	106,791,122	96,779,145	89,437,757	99,117,343	90,930,621
Other countries		10,989,000	32,326,198	32,070,924	44,263,232	[b] 40,910,604
Total		611,840,648	618,696,482	718,817,640	755,000,369	685,147,069

[a] See "General note," p. 442.
[b] Preliminary.
[c] Year preceding.
[d] Cape Colony before 1906.
[e] Not including free ports prior to Mar. 1, 1906.

COFFEE.

Coffee crop of countries named, 1904–1905 to 1908–1909.

Country.	1904–5.	1905–6.	1906–7.	1907–8.	1908–9.
NORTH AMERICA.					
United States:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Porto Rico[a]	34,484,000	21,554,000	28,503,000	38,757,000	35,256,000
Hawaii[a]	1,482,000	1,543,000	2,311,000	1,229,000	1,442,000
Total United States[b]	35,966,000	23,097,000	30,814,000	39,986,000	36,698,000
Central America:					
Guatemala	82,317,000	68,856,000	90,059,000	89,232,000	82,134,000
Costa Rica[a1]	27,731,000	39,788,000	30,367,000	38,196,000	19,792,000
Nicaragua	[a1] 21,656,000	[a1] 18,172,000	[a1] 19,419,000	[c] 14,000,000	[c] 16,800,000
Salvador	[d] 55,767,000	65,710,000	57,425,000	56,320,000	43,613,000
Honduras[a1 c]	586,000	586,000	586,000	2,140,000	2,140,000
British Honduras[e]	49,000	13,000	12,000	10,000	10,000
Total	188,106,000	193,125,000	197,868,000	199,898,000	164,489,000
Mexico	74,546,000	88,479,000	[c] 47,000,000	[c] 45,000,000	[c] 42,000,000

[a] Exports, year ending June 30; [a1], year ending December 31; [a2], year ending September 30; [a3], year ending March 31.
[b] Not including Philippine Islands.
[c] Estimated.
[d] Average, 1905–6 to 1908–9.
[e] Partial returns.

COFFEE—Continued.

Coffee crop of countries named, 1904-1905 to 1908-1909—Continued.

Country.	1904–5.	1905–6.	1906–7.	1907–8.	1908–9.
NORTH AMERICA—continued.					
West Indies:	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Haiti [a2]	48,826,000	60,860,000	64,562,000	68,904,000	[b] 68,904,000
Santo Domingo [a1]	[c] *3,126,000*	*2,149,000*	*2,917,000*	*3,363,000*	*4,073,000*
Trinidad [a3]	111,000	13,000	19,000	9,000	4,000
Jamaica [a3]	5,781,000	9,046,000	6,144,000	10,551,000	7,885,000
Guadeloupe [a1]	1,151,000	2,011,000	1,705,000	2,310,000	2,269,000
Cuba	(*d*)	(*d*)	(*d*)	6,596,000	[b] 6,596,000
Leeward Islands (British) [a3]	(*e*)	2,000	1,000	3,000	[f] 2,000
Total	58,905,000	74,081,000	75,348,000	91,736,000	89,735,000
Total North America	357,613,000	378,782,000	351,030,000	376,620,000	332,920,000
SOUTH AMERICA.					
Brazil: [a1]					
Rio de Janeiro	377,885,000	366,830,000	422,435,000	466,395,000	405,069,000
Santos	869,262,000	985,962,000	1,344,765,000	1,517,236,000	1,182,579,000
Victoria	56,001,000	50,401,000	47,140,000	60,973,000	62,885,000
Bahia	20,027,000	24,256,000	29,293,000	27,016,000	21,894,000
Other ports	2,844,000	3,878,000	3,725,000	2,511,000	2,001,000
Total Brazil [g]	1,326,019,000	1,431,327,000	1,847,358,000	2,074,131,000	1,674,428,000
Venezuela [a]	86,950,000	94,370,000	99,201,000	90,190,000	103,454,000
Colombia [h]	79,366,000	79,366,000	79,366,000	79,366,000	79,366,000
Bolivia [h]	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Ecuador [a1]	7,693,000	4,863,000	[i] 6,278,000	[i] 6,278,000	8,186,000
Peru [a1]	2,309,000	2,267,000	1,334,000	661,000	1,102,000
Dutch Guiana	[f] 532,000	594,000	481,000	522,000	[f] 532,000
British Guiana [a3]	(*e*)	(*e*)	(*e*)	(*e*)	89,000
Total South America	1,504.369,000	1,614,287,000	2,035,518,000	2,252,648.000	1,868,657,000
ASIA.					
Dutch East Indies:					
Java	46,933,000	57,867,000	65,467,000	30,400,000	[j] 50,169,000
Sumatra	6,000,000	10,133,000	4,000,000	5,600,000	[j] 6,433,000
Celebes	133,000	133,000	267,000	133,000	[j] 166,000
Total	53,066,000	68,133,000	69,734,000	36,133,000	[j] 56,768,000
Federated Malay States: [a3]					
Perak	218,000	62,000	133,000	26,000	2,000
Selangor	6,402,000	4,310,000	3,695,000	2,281,000	2,334,000
Negri Sembilan	1,019,000	446,000	522,000	259,000	94,000
British India [k]	29,062,000	31,179,000	17,695,000	33,051,000	[a3] 33,826,000
Ceylon	938,000	1,008,000	[l] 750,000	[l] 420,000	[l] 310,000
British North Borneo [a3]	50,000	41,000	12,000	3,000	[l] 3,000
Sarawak [a3]	46,000	37,000	38,000	26,000	22,000
Arabia (Aden) [a3]	(*d*)	(*d*)	12,813,000	14,370,000	[b] 14,370,000
Total Asia	90,821,000	105,216,000	105,392,000	86,569,000	107,729,000
AFRICA.					
Somaliland Protectorate [a3]	*110,000*	*5,000*	*330,000*	*198,000*	*245,000*
Southern Nigeria [a3]	53,000	88,000	69,000	39,000	37,000
Nyasaland Protectorate	938,000	636,000	506,000	885,000	1,011,000
German East Africa [a1]	886,000	884,000	1,105,000	1,393,000	[j] 1,067,000
Somali Coast [a1]	5,636,000	5,793,000	5,047,000	7,257,000	[j] 5,933,000
Liberia [h]	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Abyssinia [h]	*10,000,000*	*10,000,000*	*10,000,000*	*10,000,000*	*10,000,000*
Uganda Protectorate [a3]	13,000	34,000	12,000	13,000	22,000
Sierra Leone [a1]	33,000	10,000	23.000	16,000	21,000
Natal	25,000	9,000	31,000	28,000	19,000
Seychelles [a3]	6,000	(*e*)	6,000	7,000	6,000

[a] Exports, year ending June 30; [a1], year ending December 31; [a2], year ending September 30; [a3], year ending March 31.
[b] Year preceding.
[c] Average, 1905–6 to 1908–9.
[d] No data on production.
[e] Less than 1,000 pounds.
[f] Average, 1905–6 to 1907–8.
[g] Coffee in the grain.
[h] Average annual yield.
[i] Average, 1904–5 to 1905–6.
[j] Average, 1904–5 to 1907–8.
[k] Partial returns.
[l] Estimated.

COFFEE—Continued.

Coffee crop of countries named, 1904-1905 to 1908-1909—Continued.

Country.	1904-5.	1905-6.	1906-7.	1907-8.	1908-9.
AFRICA—continued.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Gold Coast [a2]	5,000	5,000	3,000	1,000	(b)
Belgian Congo [a1]	[c] 126,000	[c] 126,000	[c] 126,000	161,000	91,000
Total Africa	19,831,000	19,590,000	19,258,000	21,998,000	20,452,000
OCEANIA.					
New Caledonia [a1]	764,000	651,000	626,000	721,000	[d] 690,000
Queensland	133,000	82,000	107,000	112,000	116,000
Papua [a3]	21,000	6,000	48,000	39,000	[e] 27,000
Total Oceania	918,000	739,000	781,000	872,000	833,000
Grand total	1,973,552,000	2,118,614,000	2,511,979,000	2,738,707,000	2,330,591,000

[a] Exports, year ending June 30; [a1], year ending December 31; [a2], year ending September 30; [a3], year ending March 31.
[b] Less than 1,000 pounds.
[c] Average, 1907-8 to 1908-9.
[d] Average, 1904-5 to 1907-8.
[e] Estimated.

International trade in coffee, 1904-1908 [a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Brazil	Jan. 1	1,326,027,705	1,431,343,492	1,847,367,771	2,074,171,256	1,674,431,626
British India	Jan. 1	29,754,928	41,138,720	36,584,688	17,866,128	37,568,832
Colombia [b]	Jan. 1	80,000,000	67,248,000	70,000,000	80,000,000	80,000,000
Costa Rica	Jan. 1	27,730,672	39,788,002	30,367,032	38,199,587	19,797,314
Dutch East Indies	Jan. 1	77,168,254	72,864,649	75,761,218	55,998,249	[c] 53,854,210
Guatemala	Jan. 1	71,653,700	82,241,067	69,289,369	99,740,180	63,333,526
Haiti	Oct. 1	48,826,447	60,860,372	64,561,503	68,903,525	[d] 68,903,525
Jamaica	Apr. 1	5,781,440	9,046,464	6,144,432	10,551,184	7,885,136
Mexico	Jan. 1	40,268,455	47,182,496	37,568,983	29,980,000	52,501,006
Netherlands	Jan. 1	166,468,567	148,744,186	161,617,580	177,012,048	179,444,917
Nicaragua	Jan. 1	21,656,024	18,171,515	19,418,928	[c] 20,000,000	[c] 17,900,000
Salvador	July 1	78,552,505	64,480,526	68,952,128	58,751,356	57,589,360
Singapore	Jan. 1	10,638,667	7,813,067	7,860,533	6,314,400	[d] 6,314,400
United States	Jan. 1	25,568,821	21,777,960	32,821,342	41,802,527	34,265,012
Venezuela	July 1	86,950,323	94,370,089	99,200,810	90,189,684	103,453,539
Other countries		61,615,000	79,006,551	60,085,421	74,064,719	[c] 84,490,671
Total		2,158,661,598	2,286,077,156	2,687,601,738	2,943,544,843	2,541,823,034

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Argentina	Jan. 1	16,931,049	18,516,812	20,229,490	21,625,655	22,085,972
Austria-Hungary	Jan. 1	108,701,092	107,106,048	112,841,372	131,930,753	121,781,776
Belgium	Jan. 1	154,387,057	100,032,285	119,040,964	250,282,012	134,658,074
British South Africa [e]	Jan. 1	19,448,590	21,136,170	26,862,060	23,686,674	25,321,709
Cuba	Jan. 1	20,716,876	23,916,707	21,357,127	23,250,910	[d] 23,250,910
Denmark	Jan. 1	25,552,671	21,220,569	23,148,531	23,477,020	24,017,703
Egypt	Jan. 1	12,789,537	13,996,858	18,401,914	14,976,566	21,146,287
Finland	Jan. 1	23,291,871	25,743,433	29,085,091	29,007,779	28,549,443
France	Jan. 1	168,198,472	200,594,621	215,713,162	223,932,282	226,559,741
Germany [f]	Jan. 1	398,466,529	398,491,379	411,815,012	418,373,762	425,332,652
Italy	Jan. 1	39,087,728	41,287,279	45,046,159	47,356,824	50,189,703
Netherlands	Jan. 1	193,836,257	206,246,193	255,731,280	259,830,047	262,479,471
Norway	Jan. 1	23,699,731	25,311,450	28,250,644	28,808,572	27,186,340
Russia	Jan. 1	20,976,264	21,691,262	23,584,331	25,007,520	[c] 24,917,832
Singapore	Jan. 1	9,174,606	7,784,667	8,524,000	7,397,600	[d] 7,397,600
Spain	Jan. 1	22,000,781	24,084,186	28,518,089	24,895,066	27,358,595
Sweden	Jan. 1	60,623,344	66,417,080	77,507,951	71,240,034	66,899,648
Switzerland	Jan. 1	22,562,322	20,958,680	24,885,994	25,202,136	24,436,471
United Kingdom	Jan. 1	28,845,095	28,852,729	28,640,738	29,242,982	29,195,788
United States	Jan. 1	1,112,709,546	893,889,352	857,013,585	940,247,312	938,569,889
Other countries		48,415,000	80,777,562	78,324,516	95,070,607	[c] 94,001,962
Total		2,530,434,478	2,348,055,342	2,454,522,010	2,714,932,113	2,605,327,611

[a] See "General note," p. 442.
[b] Estimated except for 1905.
[c] Preliminary.
[d] Year preceding.
[e] Cape Colony before 1906.
[f] Not including free ports prior to March 1, 1906

OIL CAKE AND OIL-CAKE MEAL.

International trade in oil cake and oil-cake meal, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Argentina	Jan. 1	29,019,439	29,277,380	29,524,298	26,703,310	31,866,797
Austria-Hungary	Jan. 1	92,352,938	77,134,433	78,843,897	93,136,461	113,952,281
Belgium	Jan. 1	145,834,669	160,163,061	176,470,002	146,626,113	149,098,934
British India	Jan. 1	151,975,264	180,575,696	105,207,200	127,575,168	158,531,296
Canada	Jan. 1	17,197,800	9,190,800	34,803,800	44,286,700	41,743,700
China	Jan. 1	83,999,467	95,344,667	120,944,400	132,974,800	129,166,933
Denmark	Jan. 1	4,417,928	5,676,571	3,101,969	4,889,005	2,757,541
Egypt	Jan. 1	160,794,106	147,961,001	164,142,926	145,538,121	148,649,000
France	Jan. 1	351,628,964	339,529,396	323,482,202	312,335,633	329,693,063
Germany [b]	Jan. 1	436,964,238	397,800,450	361,592,621	396,195,045	414,855,627
Italy	*Jan. 1*	*24,696,396*	*24,425,228*	*12,617,052*	*16,901,514*	*47,744,617*
Netherlands	Jan. 1	154,525,289	143,290,470	147,620,993	206,333,847	156,919,410
Russia	Jan. 1	1,084,331,094	977,376,790	1,155,869,540	1,164,122,145	[c]1,378,461,689
United Kingdom	Jan. 1	48,462,400	57,830,080	58,524,480	49,669,760	36,910,720
United States	Jan. 1	1,650,379,342	1,861,577,352	1,929,901,354	1,959,101,228	1,959,213,339
Other countries	....	57,906,820	100,683,961	124,546,370	128,143,233	[c]104,230,468
Total	....	4,494,486,154	4,607,837,336	4,827,193,104	4,954,532,083	5,203,795,415

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	27,340,840	26,469,794	24,769,590	36,386,625	27,152,565
Belgium	Jan. 1	445,202,134	448,216,564	510,213,668	423,941,798	553,066,958
Canada	*Jan. 1*	*2,671,500*	*3,606,600*	*1,889,700*	*4,290,000*	*3,741,000*
Denmark	Jan. 1	757,481,664	842,875,492	843,140,047	947,748,259	1,036,950,572
Dutch East Indies	Jan. 1	31,004,951	19,075,498	26,850,775	21,089,491	[d]21,089,491
Finland	Jan. 1	13,948,954	11,179,475	14,543,404	23,857,077	20,873,178
France	Jan. 1	292,015,079	323,719,234	237,725,713	247,780,333	200,278,445
Germany [b]	Jan. 1	1,231,409,255	1,285,529,859	1,325,022,674	1,573,607,155	1,463,990,742
Italy	Jan. 1	6,525,902	5,209,963	7,851,541	10,577,997	10,834,835
Japan	Jan. 1	82,023,067	110,074,533	134,060,451	162,850,133	139,939,333
Netherlands	Jan. 1	495,921,130	510,951,427	564,097,473	639,972,913	701,182,543
Sweden	Jan. 1	219,913,686	226,374,498	264,890,580	317,805,100	258,508,025
United Kingdom	Jan. 1	823,934,720	797,368,320	797,115,200	731,057,600	736,330,560
Other countries	....	54,135,136	153,440,166	143,088,371	157,950,252	[c]162,678,933
Total	....	4,483,528,018	4,764,091,423	4,895,859,187	5,298,914,733	5,336,626,180

[a] See "General note," p. 442.
[b] Not including free ports prior to March 1, 1906.
[c] Preliminary.
[d] Year preceding.

ROSIN.

International trade in rosin, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904	1905.	1906.	1907.	1908.
		Pounds	*Pounds.*	*Pounds*	*Pounds*	*Pounds*
Austria-Hungary	Jan. 1	3,627,485	3,372,410	3,154,594	3,019,450	2,631,878
Germany[b]	Jan. 1	45,617,597	46,370,255	46,088,946	55,019,208	60,858,460
Netherlands	Jan. 1	83,943,225	58,544,509	79,550,046	76,673,153	86,708,021
United States	Jan. 1	700,425,880	632,275,280	694,755,320	738,121,720	728,330,080
Other countries		338,000	675,870	18,210,324	42,505,829	[c]34,070,205
Total		833,952,187	741,238,324	841,759,230	915,339,360	912,750,854

IMPORTS.

Country.	Year beginning—	1904	1905.	1906.	1907.	1908.
Argentina	Jan. 1	27,846,666	20,409,438	22,957,066	23,206,173	23,529,126
Australia	Jan. 1	15,552,880	14,037,408	10,326,800	15,618,176	18,015,312
Austria-Hungary	Jan. 1	64,824,926	62,482,294	73,355,049	74,316,926	82,300,744
Brazil	Jan. 1	26,297,077	27,492,124	21,608,730	26,820,551	34,134,162
Canada	Jan. 1	26,071,000	18,907,000	19,167,200	21,856,300	17,004,000
Chile	Jan. 1	1,935,923	2,108,756	3,536,588	3,173,882	[c]2,112,898
Cuba	Jan. 1	2,184,454	1,760,478	1,536,070	3,709,909	[d]3,709,909
Denmark	Jan. 1	2,135,176	2,033,764	2,326,979	2,430,414	2,382,094
Finland	Jan. 1	3,389,956	5,133,632	3,893,252	7,509,485	7,042,101
Germany[b]	Jan. 1	233,541,561	208,295,553	235,300,629	247,632,623	280,217,917
Italy	Jan. 1	32,527,875	27,530,477	32,796,618	33,591,825	38,811,048
Japan	Jan. 1	5,463,167	6,378,787	6,599,144	7,120,409	8,035,293
Netherlands	Jan. 1	89,756,661	78,666,949	80,488,983	90,920,593	98,809,593
Russia	Jan. 1	65,493,091	59,632,597	60,581,028	67,762,383	[c]74,970,173
Servia	Jan. 1	4,887,332	7,894,169	1,371,797	4,562,763	([e])
Spain	Jan. 1	3,983,117	3,684,871	4,696,182	5,633,909	4,812,403
Sweden	Jan. 1	13,440,652	11,443,057	13,110,667	12,885,526	14,050,543
Switzerland	Jan. 1	6,640,101	5,736,867	5,306,746	5,271,031	4,626,620
United Kingdom	Jan. 1	199,577,952	177,116,624	174,896,752	177,534,336	171,698,688
Uruguay	July 1	5,093,582	4,881,232	[f]4,881,232	[c]682,304	[d]682,304
Other countries		12,775,980	13,005,454	27,285,931	22,195,464	[c]22,560,618
Total		844,019,128	758,534,531	806,123,452	854,453,036	915,505,536

[a] See "General note," p. 442.
[b] Not including free ports prior to March 1, 1906.
[c] Preliminary.
[d] Year preceding.
[e] Not stated.
[f] Figures for 1905.

TURPENTINE.

International trade in spirits of turpentine, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Gallons.	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
France	Jan. 1	1,459,297	3,179,105	3,367,371	2,538,714	2,397,710
Germany[b]	Jan. 1	569,650	520,760	460,735	349,555	433,239
Netherlands	Jan. 1	876,929	972,714	1,400,645	1,675,788	1,851,937
Russia	Jan. 1	2,163,759	2,504,423	1,804,858	1,831,320	[c]1,725,389
United States	Jan. 1	16,426,756	15,614,323	16,182,500	17,176,843	19,433,181
Other countries		112,536	89,867	105,869	1,002,284	[c]1,199,472
Total		21,608,927	22,881,182	23,321,978	24,574,504	27,040,928

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Argentina	Jan. 1	344,877	290,804	570,426	521,857	446,967
Australia	Jan. 1	437,032	291,809	377,650	522,656	395,430
Austria-Hungary	Jan. 1	2,071,855	2,021,485	2,218,095	2,291,153	2,406,559
Canada	Jan. 1	758,513	789,880	842,525	1,028,936	1,081,181
Chile	Jan. 1	85,896	136,124	173,918	207,237	[c]115,170
Germany[b]	Jan. 1	8,438,956	8,539,910	9,966,790	8,986,101	10,088,871
Italy	Jan. 1	816,629	687,291	948,171	921,287	1,020,128
Netherlands	Jan. 1	2,220,156	2,248,055	2,711,797	3,036,027	3,932,356
New Zealand	Jan. 1	285,631	153,909	158,399	145,808	138,807
Russia	Jan. 1	204,734	192,902	314,342	333,482	[c]105,329
Sweden	Jan. 1	138,884	115,383	141,077	146,202	148,913
Switzerland	Jan. 1	372,367	346,279	462,297	40,482	503,879
United Kingdom	Jan. 1	7,907,418	7,693,933	7,673,758	7,515,293	8,656,464
Other countries		584,103	711,974	1,884,017	982,536	[c]996,370
Total		24,667,111	24,219,834	28,443,262	26,679,057	30,036,424

[a] See "General note" p. 442. [b] Not including free ports prior to March 1, 1906. [c] Preliminary.

INDIA RUBBER.

International trade in india rubber, 1904-1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Angola	Jan. 1	5,617,377	[b] 5,200,000	[b] 5,200,000	[b] 5,200,000	[b] 5,200,000
Belgian Kongo	Jan. 1	[b] 10,040,000	10,718,358	10,660,000	10,266,314	10,052,913
Belgium	Jan. 1	16,335,876	14,997,420	16,940,908	13,886,021	15,036,638
Bolivia	Jan. 1	4,915,638	3,728,726	4,254,658	4,035,589	4,008,415
Brazil	Jan. 1	70,251,499	78,027,329	77,073,901	80,446,154	84,231,126
Dutch East Indies	Jan. 1	3,590,489	4,569,275	4,564,932	14,068,061	[c] 14,068,061
Ecuador	Jan. 1	1,145,447	1,293,134	1,394,575	1,093,670	887,065
France	Jan. 1	6,632,627	10,766,377	13,033,578	12,751,379	13,045,487
French Guinea	Jan. 1	2,952,245	3,121,366	3,374,026	2,864,282	[c] 2,864,282
French Kongo	Jan. 1	2,753,778	3,716,860	4,310,092	4,061,352	[c] 4,061,352
Germany [d]	Jan. 1	10,073,138	18,654,850	19,887,013	10,500,394	9,099,798
Gold Coast Colony	Jan. 1	4,013,837	3,687,778	3,649,668	3,549,548	[c] 3,549,548
Ivory Coast	Jan. 1	3,386,399	2,602,638	3,347,895	3,024,783	[c] 3,024,783
Kamerun	Jan. 1	1,920,354	2,141,777	2,537,540	3,291,084	2,677,117
Netherlands	Jan. 1	3,998,671	5,760,814	5,605,388	4,121,106	3,774,042
Peru	Jan. 1	4,896,298	5,598,785	5,678,357	6,677,097	[c] 6,677,097
Senegal	Jan. 1	2,208,623	2,242,786	2,618,511	2,293,164	[c] 2,293,164
Singapore	Jan. 1	3,026,133	5,053,067	5,888,000	5,422,133	[c] 5,422,133
Southern Nigeria	Jan. 1	2,408,926	2,842,831	3,434,279	2,843,823	[c] 2,843,823
Venezuela	July 1	109,440	219,693	309,100	426,123	700,984
Other countries	....	8,644,052	11,714,817	18,266,180	25,194,477	[e] 24,004,267
Total	....	168,920,847	196,658,681	212,118,141	215,956,574	217,582,135

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	2,935,675	3,021,875	4,231,331	4,967,454	4,237,804
Belgium	Jan. 1	17,983,033	18,744,212	20,813,069	18,292,494	17,783,460
Canada	Jan. 1	3,236,574	2,504,217	2,542,580	2,777,668	1,868,569
France	Jan. 1	14,611,040	19,693,018	23,053,199	24,111,907	22,097,539
Germany [d]	Jan. 1	38,375,855	47,627,110	51,488,947	34,851,767	32,498,112
Italy	Jan. 1	1,474,451	1,690,725	2,586,242	2,241,600	3,298,906
Netherlands	Jan. 1	5,371,310	6,645,498	8,180,950	8,142,875	6,522,685
Russia	Jan. 1	13,064,780	12,913,540	16,702,892	15,036,756	[e] 16,611,898
United Kingdom	Jan. 1	22,140,048	29,000,832	31,004,400	35,646,016	24,253,600
United States	Jan. 1	61,889,758	64,147,701	67,907,251	68,653,291	76,289,474
Other countries	....	8,050,120	9,278,344	11,639,538	11,271,855	[e] 11,344,457
Total	....	189,132,644	215,267,072	240,159,419	225,993,743	216,806,304

[a] See "General note," p. 442.
[b] Estimated.
[c] Year preceding.
[d] Not including free ports prior to March 1, 1906.
[e] Preliminary.

SILK.

Raw silk production of countries named, 1904–1908.

[Estimate of the Silk Manufacturers' Association of Lyons, France.]

Country.	1904.	1905.	1906.	1907.	1908.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Western Europe:					
Italy	10,803,000	9,788,000	10,461,000	10,626,000	9,890,000
France	1,378,000	1,393,000	1,333,000	1,459,000	1,446,000
Spain	170,000	172,000	124,000	181,000	166,000
Austria-Hungary	694,000	761,000	754,000	761,000	736,000
Total	13,045,000	12,114,000	12,672,000	13,027,000	12,238,000
Levant and Central Asia:					
Anatolia	1,096,000	1,424,000	1,221,000	1,327,000	1,356,000
Syria and Cyprus	1,036,000	1,080,000	1,037,000	1,179,000	1,080,000
Other provinces of Asiatic Turkey				322,000	320,000
Salonica and Adrianople	564,000	617,000	567,000	754,000	628,000
Balkan States	337,000	419,000	408,000	496,000	456,000
Greece and Crete	143,000	155,000	165,000	168,000	143,000
Caucasus	794,000	640,000	1,003,000	1,085,000	794,000
Persia and Turkestan (exports)	939,000	1,014,000	1,385,000	1,340,000	1,160,000
Total	4,909,000	5,349,000	5,786,000	6,671,000	5,937,000
Far East:					
China—					
Exports from Shanghai	9,293,000	8,841,000	9,396,000	9,160,000	12,430,000
Exports from Canton	4,705,000	4,409,000	4,325,000	4,960,000	5,242,000
Japan—					
Exports from Yokohama	12,846,000	10,183,000	13,210,000	14,044,000	16,689,000
British India—					
Exports from Calcutta and Bombay [a]	397,000	617,000	717,000	772,000	551,000
Total	27,241,000	24,050,000	27,648,000	28,936,000	34,912,000
Grand total	45,195,000	41,513,000	46,106,000	48,634,000	53,087,000

[a] Exports from Bombay included for the first time in 1905.

WOOD PULP.

International trade in wood pulp, 1904-1908.[a]

EXPORTS.

Country.	Year beginning—	1904	1905.	1906	1907.	1908
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds*
stria-Hungary	Jan. 1	147,236,342	166,589,306	170,770,020	187,836,660	177,828,334
gium	Jan. 1	68,359,246	54,872,925	68,233,066	72,943,332	54,463,760
iada[b]	Jan. 1	359,000,000	349,000,000	397,000,000	483,000,000	480,000,000
iland	Jan. 1	130,027,777	133,477,320	123,858,426	135,410,176	140,860,769
many[c]	Jan. 1	155,086,119	153,651,351	156,740,026	211,885,779	283,362,458
rway	Jan. 1	981,629,727	975,158,500	1,114,716,540	1,227,103,672	1,316,902,325
eden	Jan. 1	865,367,383	846,213,535	914,501,258	1,170,316,873	1,242,850,222
itzerland	Jan. 1	14,938,960	14,004,420	13,901,905	13,066,133	12,338,167
ited States	Jan. 1	20,172,901	26,379,946	28,267,399	24,839,012	22,595,379
ier countries		3,137,000	49,843,083	79,751,207	75,160,286	[d] 56,805,575
Total		2,744,955,455	2,769,190,476	3,067,739,747	3,599,561,923	3,780,007,013

IMPORTS.

Country.	Year beginning—	1904	1905.	1906	1907.	1908
gentina	Jan. 1	35,123,171	30,886,404	37,368,826	40,845,920	39,930,837
stria-Hungary	Jan. 1	5,342,661	4,702,018	4,050,552	4,304,084	5,486,202
gium	Jan. 1	177,288,153	174,530,060	228,929,053	243,156,228	265,428,111
nmark	Jan. 1	64,105,345	67,310,417	64,300,231	80,113,097	75,010,069
ance	Jan. 1	465,941,055	490,908,886	563,826,785	630,970,533	692,701,492
many[c]	Jan. 1	155,961,354	109,748,067	103,547,347	116,995,542	99,261,783
ly	Jan. 1	85,246,119	93,789,911	114,677,382	126,906,861	135,943,606
pan	Jan. 1	22,726,098	22,769,993	37,020,066	35,476,759	40,753,602
ssia	Jan. 1	49,107,233	44,467,063	46,715,121	45,479,955	[d] 48,032,844
ain	Jan. 1	62,599,816	70,535,843	76,781,583	82,575,953	79,954,210
eden	Jan 1	6,918,148	6,579,205	7,882,006	6,091,936	6,448,409
itzerland	Jan. 1	11,229,512	19,680,440	16,764,828	19,232,681	20,914,147
ited Kingdom	Jan. 1	1,263,028,480	1,280,780,480	1,341,735,360	1,484,703,360	1,602,662,400
ited States	Jan. 1	358,648,640	341,734,400	399,403,209	593,555,200	500,060,689
ier countries		6,753,000	122,801,943	118,569,048	25,424,495	[d] 21,684,904
Total		2,773,518,805	2,881,315,130	3,161,571,988	3,536,432,004	3,608,082,295

[a] See "General note," p. 442.
[b] Estimated from value.
[c] Not including free ports prior to March 1, 1906.
[d] Preliminary.

FARM ANIMALS AND THEIR PRODUCTS.

[*Figures furnished by the Bureau of Statistics, Department of Agriculture, except where otherwise credited.* All prices on gold basis.]

Live stock of countries named.

[Africa incompletely represented, through lack of statistics for large areas. Number of animals in China, Persia, Afghanistan, Korea, Bolivia, Ecuador, Salvador, and several less important countries unknown. For Brazil number of cattle alone estimated, but roughly. In general, statistics of cattle, horses, sheep, and swine much more complete than those of other animals, as statements for the world.]

Country.	Year.	Cattle.		Horses.	Mules.	Sheep.	Swine.
		Total.	Dairy cows.				
NORTH AMERICA.							
United States:							
Contiguous—							
On farms	1910	69,080,000	21,801,000	21,040,000	4,123,000	57,216,000	47,782,000
Not on farms	1900	1,616,422	973,033	2,936,881	173,908	231,301	1,818,114
Noncontiguous—							
Alaska [a]	1900	18	13	5	...	...	10
Hawaii [a]	1900	102,908	4,028	12,982	6,506	102,098	8,057
Porto Rico	1899	260,225	73,372	58,664	6,985	6,363	66,180
Total United States (except Philippine Islands)	...	71,059,573	22,851,446	24,048,582	4,310,399	57,555,762	49,674,361
Bermuda	1908	1,516	...	[b] 1,082	...	...	...
Canada:							
Prince Edward Island	*1909*	*111,928*	*53,915*	*34,121*	...	*109,244*	*47,853*
Nova Scotia	1909	330,170	147,663	68,128	...	361,444	70,508
New Brunswick	1909	236,427	122,577	66,496	...	215,289	94,140
Ontario	1909	3,032,005	1,260,572	821,011	...	1,118,945	1,586,565
Quebec	1909	1,479,467	856,579	362,796	...	570,342	670,042
Manitoba	*1909*	*501,194*	*167,442*	*237,161*	...	*29,074*	*172,374*
Saskatchewan	1909	515,975	124,186	279,063	...	129,630	131,757
Alberta	1909	1,026,918	116,371	263,713	...	171,422	139,270
British Columbia	1901	125,002	24,535	37,325	...	33,350	41,419
Total Canada	...	*7,359,086*	*2,873,840*	*2,169,814*	...	*2,738,740*	*2,953,928*
Central America:							
Guatemala	1898	196,768	...	50,343	...	77,593	29,784
Honduras	1907	600,000	...	45,000	15,000	15,000	120,000
Nicaragua	...	1,200,000	...	...	...	...	...
Panama	1907	65,000	...	17,000	1,500	...	28,000
Costa Rica	1907	373,630	[c] 95,462	63,651	4,831	187	111,316
Mexico	1902	5,142,457	...	859,217	334,435	3,424,430	616,139
Newfoundland	1901	32,767	...	8,851	...	78,052	34,679
West Indies:							
British—							
Barbados	1907	...	...	[d] 2,468	3,945	...	...
Dominica	1903	1,437	...	[d] 583	...	1,088	...
Grenada	1901	1,908	...	1,074	...	1,975	...
Jamaica	1908	102,400	...	52,446	...	13,827	30,000
Montserrat	1908	...	...	286	...	...	...
Turks and Caicos Islands	1908	700	...	101	...	175	...
Virgin Islands	*1907*	*2,000*	...	*[d] 220*	...	*300*	...
Cuba	1909	2,968,867	...	499,560	57,096	[e] 9,982	[e] 358,868
Dutch West Indies	1906	3,763	...	816	183	22,385	4,143
Guadeloupe	(*f*)	30,560	...	8,819	6,311	11,731	32,656
Total	...	*89,142,432*	...	*27,829,863*	*4,733,700*	*63,951,227*	*53,993,874*
SOUTH AMERICA.							
Argentina	1908	29,116,625	...	7,531,376	465,037	67,211,754	1,403,591
Brazil	...	30,000,000	...	...	...	...	...
British Guiana	1908	70,000	...	1,650	...	18,200	12,800
Chile	1908	2,303,659	205,084	516,764	[g] 83,092	4,224,266	216,380

[a] On farms.
[b] *Including mules and asses.*
[c] Cows.
[d] Data for 1908.
[e] Census for 1899.
[f] Official estimate furnished by the French embassy to the United States, under date of May 4, 1906.
[g] Including asses.

Live stock of countries named—Continued.

Country.	Year.	Cattle. Total.	Cattle. Dairy cows.	Horses.	Mules.	Sheep.	Swine.
SOUTH AMERICA—con.							
Colombia	......	2,800,000	....	341,000	257,000	746,000	2,300,000
Dutch Guiana	1907	7,115	....	257	125	114	2,534
Falkland Islands	1908	5,382	....	3,314	....	688,705	75
Paraguay	1900	2,283,039	....	182,789	3,490	214,058	23,887
Uruguay [a]	1908	9,000,000	....	1,000,000	60,000	26,000,000	180,000
Venezuela	1899	2,004,257	....	191,079	89,186	176,668	1,618,214
Total	......	77,500,077	....	9,768,229	957,930	99,279,765	5,697,461
EUROPE.							
Austria-Hungary:							
Austria	1900	9,511,170	[b] 4,749,152	1,716,488	20,323	2,621,026	4,082,654
Hungary	1895	6,605,365	[c] 3,499,724	2,308,457	1,911	8,122,682	7,330,343
Bosnia-Herzegovina	1895	[d] 1,417,341	....	[e] 239,626	....	3,230,720	662,242
Total Austria-Hungary	......	17,533,876	....	4,264,571	22,234	13,974,428	12,075,239
Belgium	[f] 1906	1,788,328	889,125	245,212	[g] [h] 6,915	[h] 235,722	1,046,519
Bulgaria	1905	1,605,535	[b] 493,451	538,273	11,947	8,131,004	465,337
Denmark	1903	1,840,466	[b] 1,089,073	486,935	....	876,830	1,456,699
Faroe Islands	1909	4,093	....	615	....	99,900	58
Finland	1906	1,476,525	[b] 1,103,201	325,642	....	912,407	218,923
France	[f] 1908	13,949,722	[b] 7,336,214	3,094,698	191,715	17,460,284	6,995,124
Germany	1907	20,630,544	10,222,792	4,345,043	942	7,703,710	22,146,532
Gibraltar	1907	69	....	301	....	....	....
Greece	1902	406,744	....	159,068	88,869	4,568,158	79,716
Iceland	1907	24,367	....	46,592	....	536,195	....
Italy	1908	6,198,990	....	955,031	388,361	11,160,420	2,503,733
Luxemburg	1907	103,485	58,449	18,847	[g] 27	6,467	134,067
Malta	1908	7,060	....	3,835	3,456	14,063	5,724
Montenegro	......	60,000	[b] 20,000	3,000	....	400,000	8,000
Netherlands	1904	1,690,463	[i] 973,098	295,277	....	606,785	861,840
Norway	[f] 1908	1,094,101	[b] 727,898	172,468	....	1,393,488	318,556
Portugal [a]	1906	857,000	18,500	[j] 90,000	[j] 59,100	3,150,000	1,300,000
Roumania	1900	2,545,051	380,720	864,324	515	5,655,444	1,709,205
Russia:							
Russia proper	1908	30,800,826	....	20,934,415	....	[k] 38,048,736	9,953,973
Poland	1908	2,377,285	....	1,280,410	....	[k] 1,339,274	746,352
Northern Caucasia	1908	2,876,437	....	1,358,193	....	[k] 6,452,531	781,700
Total Russia, European	......	36,054,548	....	23,573,018	....	45,840,541	11,482,025
Servia	1905	969,953	[l] 153,359	174,363	739	3,160,166	908,108
Spain	1908	2,452,197	....	445,776	832,252	16,119,051	2,120,177
Sweden	[f] 1908	2,628,982	[b] 1,804,473	566,227	....	1,021,727	878,828
Switzerland	1906	1,498,144	[b] 785,950	135,372	8,153	209,997	548,970
Turkey	......	1,000,000	[b] 300,000	600,000	....	10,000,000	....
United Kingdom:							
Great Britain	1909	7,020,982	[m] 2,794,176	[n] 1,552,993	....	27,618,419	2,380,887
Ireland	1909	4,698,412	[m] 1,548,574	[n] 599,293	30,470	4,132,392	1,148,715
Isle of Man and Channel Islands	1908	41,200	[m] 18,160	[n] 9,670	....	86,564	14,471
Total United Kingdom	......	11,760,594	4,360,910	2,161,956	....	31,837,375	3,544,073
Total	......	128,262,837	....	43,566,444	1,640,704	185,066,222	71,407,453

[a] Estimate.
[b] Cows.
[c] Cows over 1 year old, including buffalo cows.
[d] Including buffaloes.
[e] Including mules and asses.
[f] On December 31 of preceding year.
[g] Including asses.
[h] Data for 1895.
[i] Including cows kept for breeding purposes.
[j] Data for 1886.
[k] Including goats.
[l] Census, December 31, 1900.
[m] Cows and heifers in milk and with calf.
[n] Used for agriculture and also unbroken.

Live stock of countries named—Continued.

Country.	Year.	Cattle.		Horses.	Mules.	Sheep.	Swine.
		Total.	Dairy cows.				
ASIA.							
British India [a]	1907	[b] 91,284,634	[c] 26,734,705	1,463,293	55,966	[d] 21,824,229	....
Ceylon	*1908*	*1,054,102*	....	*3,643*	....	*100,603*	*93,371*
Cochin China	1903	109,000	....	11,243	....	....	709,400
Cyprus	1907	57,096	....	[e] 62,743	....	[f] [g] 301,669	[g] 33,952
Hongkong	1908	1,374	....	172	....	....	....
Japanese Empire:							
Japan	[h] 1908	1,237,161	....	1,495,252	....	3,949	317,640
Formosa	[h] 1907	111,925	[c] 45,390	263	....	....	1,074,316
Total Japanese Empire	....	1,349,086	....	1,495,515	....	3,949	1,391,956
Dutch East Indies:							
Java and Madura	1905	2,654,461	....	363,974	....	....	....
Other	1905	449,268	....	118,645	....	....	....
Total	....	3,103,729	....	482,619	....	....	....
Philippine Islands	1903	127,559	....	144,171	290	30,428	1,179,371
Russia:							
Central Asia (4 provinces)	1908	1,926,983	....	2,004,328	....	[i] 7,532,749	80,016
Siberia (4 provinces)	1908	4,026,822	....	3,138,883	....	[i] 4,078,550	864,106
Transcaucasia	1902	2,304,977	....	388,936	....	6,302,258	309,479
Other	1903	2,343,000	....	1,624,000	....	5,443,000	186,400
Total Russia (Asiatic)	....	10,601,782	....	7,156,147	....	23,356,557	1,440,001
Siam	1904	2,209,522	....	71,624	....	....	....
Straits Settlements and Labuan	1908	43,527	....	2,316	....	....	80,021
Turkey, Asiatic	....	3,000,000	....	800,000	....	45,000,000	....
Total	....	112,942,011	....	11,693,486	56,256	90,617,435	4,928,072
AFRICA.							
Algeria	1907	1,081,734	....	221,453	174,182	9,314,515	97,587
Basutoland	1904	213,361	....	64,621	[j] 26	[j] 2,794	[j] 476
British East Africa	1908	714,494	....	215	....	3,740,110	1,870
Cape of Good Hope	*1904*	*1,954,390*	*540,310*	*255,060*	*64,433*	[k] *16,323,987*	*385,945*
Egypt	1900	[g] 737,732	....	80,000	10,000	....	....
Gambia	1907	82,781	....	3,851	....	....	....
German East Africa	1905	523,052	....	73	79	1,560,000	1,447
German Southwest Africa	1907	52,189	[c] 18,471	2,141	1,234	111,595	1,202
Madagascar [l]	1905	2,867,612	[c] 1,118,162	1,074	464	333,454	522,021
Mauritius [m]	1908	12,442	....	694	[n] 133	1,409	4,123
Mayotte	(o)	47,894	....	21	15	124	....
Natal	1908	538,413	....	57,677	4,424	945,477	70,657
Nyasaland Protectorate	1908	54,581	....	[e] 207	....	18,796	36,943
Orange River Colony	1907	585,077	....	127,579	....	8,020,308	62,439
Réunion	(o)	4,720	....	1,780	4,534	4,583	....
Rhodesia [p]	1907	276,800	....	....	....	[q] 204,000	....
St. Helena	1901	1,014	....	120	....	2,094	280

[a] Including native States, as far as officially shown. *Statistics cover only 8 districts of Bengal, collected between 1889 and 1905.*
[b] Including buffalo calves.
[c] Cows.
[d] Of which 373,003 in Alwar include goats.
[e] Including mules and asses.
[f] Not less than 1 year old; 30 per cent may be added for those less than 1 year old.
[g] Data for 1908.
[h] On December 31 of preceding year.
[i] *Including goats.*
[j] Excluding animals owned by natives.
[k] Census 1909.
[l] Not including animals in the public service.
[m] On sugar estates only.
[n] Including asses; data for 1907.
[o] Official estimate furnished by the French embassy to the United States, under date of May 4, 1906.
[p] Cattle owned by natives only.
[q] Including goats of northwestern Rhodesia. No data for northeastern Rhodesia.

Live stock of countries named—Continued.

Country.	Year.	Cattle.		Horses.	Mules.	Sheep	Swine.
		Total.	Dairy cows.				
AFRICA—continued.							
Seychelles	1908	1,000	....	150	....	200	6,000
Sierra Leone	1908	1,324	....	68	....	804	72
Southern Nigeria Colony (Lagos)	1902	1,522	....	108	....	1,610	2,426
Sudan (Anglo-Egyptian) [a]	[b]1905	314,996	....	9,314	....	1,421,721	....
Transvaal	1908	662,388	....	55,933	9,011	2,810,053	167,003
Tunis	[c]1909	158,062	....	31,870	16,502	833,562	14,044
Total	......	10,887,578	....	914,009	285,127	45,651,256	1,375,735
OCEANIA.							
Australia:							
Queensland	[d]1909	4,321,600	....	510,969	....	18,348,851	124,749
New South Wales	[d]1909	2,950,945	[e] 775,491	590,509	....	43,329,384	215,649
Victoria	[d]1909	1,574,162	[e] 700,279	424,903	....	12,545,742	179,358
South Australia	[d]1909	748,368	....	235,136	....	6,952,499	81,165
Western Australia	1908	742,110	31,512	116,850	243	4,098,519	46,673
Tasmania	[d]1909	205,827	....	39,281	....	1,728,053	47,945
Total Australia	......	10,543,012	....	1,926,678	243	87,003,048	695,539
Fiji [f]	1908	36,037	....	[g] 4,950	....	2,071	3,716
New Caledonia	([h])	73,862	....	2,938	12	9,442	2,438
New Zealand [i]	1908	1,773,326	[j] 600,363	363,259	[k] 425	[l] 23,373,220	245,092
Territory of Papua	1908	822	....	212	....	39	195
Total	......	12,427,059	....	2,298,037	680	110,388,720	946,980
Grand total	......	431,251,994	....	96,070,068	7,674,397	594,954,625	138,349,575

Country.	Year.	Asses.	Buffaloes.	Camels.	Goats.	Reindeer.
NORTH AMERICA.						
United States:						
Contiguous—						
On farms	1900	94,165	....	....	1,870,599	....
Not on farms	1900	15,847	....	....	78,353	....
Noncontiguous—						
Alaska	1906	....	....	....	....	12,828
Hawaii [m]	1900	1,438	....	....	653	....
Porto Rico	*1899*	*1,085*	....	....	15,991	....
Total United States (except Philippine Islands)	......	112,535	....	....	1,965,596	12,828
Central America:						
Costa Rica	1907	67	....	....	670	....
Panama	1907	47	....	....	3,000	....
Mexico	1902	287,991	....	....	4,206,011	....
Newfoundland	1901	....	....	....	17,355	450
West Indies:						
British—						
Barbados	1907	3,726	....	....	....	....
Jamaica	1907	....	....	....	16,200	....
Cuba	1908	3,114	....	....	[n] 18,564	....

[a] Animals assessed for tribute and tax.
[b] On December 31 of preceding year.
[c] January 1.
[d] Year ending March 31.
[e] Data for 1908.
[f] Excluding animals owned by natives.
[g] Including mules and asses.
[h] Official estimate furnished by the French embassy to the United States, under date of May 4, 1908.
[i] Including animals owned by Maoris.
[j] Figures for 1907.
[k] Including asses; figures for 1907.
[l] Data for April 30, 1909.
[m] On farms.
[n] Census for 1899.

Live stock of countries named—Continued.

Country.	Year.	Asses.	Buffaloes.	Camels.	Goats.	Reindeer.
NORTH AMERICA—continued.						
West Indies—Continued.						
Dutch	1906	5,540			57,181	
Guadeloupe	(a)	4,394			13,902	
Total		417,414			6,298,479	13,278
SOUTH AMERICA.						
Argentina	1908	285,088			3,245,086	
British Guiana	1907	5,750			13,500	
Chile	1908				343,810	
Colombia					361,000	
Dutch Guiana	1907	523			1,660	
Paraguay	1900	4,067			32,334	
Uruguay [b]	1908				40,000	
Venezuela	1899	312,810			1,667,272	
Total		608,238			5,704,662	
EUROPE.						
Austria-Hungary:						
Austria	1900	46,324			1,019,664	
Hungary	1895	23,855	133,000		308,810	
Bosnia-Herzegovina	1895				1,447,049	
Total Austria-Hungary		70,179	133,000		2,775,523	
Belgium	[c]1905				257,669	
Bulgaria	1905	124,080	476,877		1,384,128	
Denmark	1903				38,984	
Faroe Islands	1909				13	
Finland	1906				5,674	141,572
France	[c]1907	361,073			1,421,009	
Germany	1907	10,349			3,533,970	
Greece	1902	141,179			3,339,409	
Iceland	1907				581	
Italy	1908	848,988	19,362		2,714,513	
Luxemburg	1907				11,344	
Malta	1908	3,764			20,920	
Montenegro					100,000	
Netherlands	1904				165,497	
Norway	[c]1907				222,217	133,473
Portugal		146,500			998,680	
Roumania	1900	7,186	43,475		232,515	
Russia:						
Russia proper	1905			224,500		347,000
Poland				1,000		
Total Russia, European				225,500		347,000
Servia	1905	1,247	7,710		510,063	
Spain	1908	790,030		2,250	3,355,404	
Sweden	1907				65,798	235,600
Switzerland	1906	1,679			362,117	
United Kingdom: Ireland	1909	243,607			252,024	
Total		2,749,861	680,424	227,750	21,768,052	857,645
ASIA.						
British India [d]	1907	[e]1,340,286	15,134,501	442,301	28,546,674	
Ceylon	1908		579,069		174,072	
Cochin China	1903		241,750			
Cyprus	1908			1,212	[f]261,505	
Hongkong	1907				153	
Japanese Empire:						
Japan	1907				80,901	
Formosa	[c]1906		240,655		114,158	
Total Japanese Empire			240,655		195,059	

[a] Official estimate furnished by the French embassy to the United States, under date of May 4, 1906.
[b] Estimate.
[c] On December 31 of preceding year.
[d] Including native States, as far as officially shown. Statistics cover only 8 districts of Bengal, collected between 1889 and 1905.
[e] Of which 61,025 in Bengal, Alwar, Gwalior, and Marwar includes mules.
[f] Not less than 1 year old; 30 per cent may be added for those less than 1 year old.

Live stock of countries named—Continued.

Country.	Year.	Asses.	Buffaloes.	Camels.	Goats.	Reindeer.
ASIA—continued.						
Dutch East Indies:						
Java and Madura	1905		2,186,993			
Other	1905		446,540			
Total Dutch East Indies			2,633,533			
Philippine Islands	1903		[a] 640,871		124,334	
Russia:						
Central Asia (4 provinces)	1903			365,000		
Siberia (4 provinces)	1903			500		38,700
Transcaucasia	1902	122,312	338,042	17,122	745,086	
Other	1903	58,500		296,000	802,000	20,000
Total Russia, Asiatic		180,812	338,042	678,622	1,547,086	58,700
Siam [b]	1904		2,288,956			
Turkey, Asiatic		2,500,000			9,000,000	
Total		4,021,098	22,097,377	1,122,135	39,848,883	58,700
AFRICA.						
Algeria	1907	265,922		211,270	4,253,425	
Basutoland	1904	[c] 10			1,625	
British East Africa	1906				1,150,000	
Cape of Good Hope	1904	100,470			[d] 7,376,346	
Egypt	1900	120,000	[e] 750,548	40,000		
German East Africa	1905	8,777		24	1,820,000	
German Southwest Africa	1907	1,630		28	103,259	
Madagascar [f]	1905	411			66,747	
Mauritius [g]	1907				6,938	
Mayotte	([h])	58			1,508	
Natal	1908	5,442			803,527	
Nyasaland Protectorate	1907	100	8		78,511	
Orange River Colony	1903	3,096			308,920	
Réunion	([h])	1,916			4,156	
Rhodesia	1908				562,000	
Seychelles	1907				500	
St. Helena	1901	774			1,001	
Southern Nigeria Colony (Lagos)	1902				2,600	
Sudan (Anglo-Egyptian) [i]	1905	[j] 92,272		132,116	1,329,711	
Transvaal	1908	26,510			1,525,705	
Tunis	1909	78,002		[k] 147,229	476,386	
Total		705,480	750,556	530,676	19,872,865	
OCEANIA.						
Australia:						
New South Wales	[k] 1905			853	37,716	
South Australia	1905				26,948	
Western Australia	[l] 1909	1,440		3,454	29,492	
Tasmania	1908				1,460	
Total		1,440		4,307	95,616	
Fiji	1907				10,817	
New Caledonia	([h])				6,111	
New Zealand [m]	1891				9,055	
Total		1,440		4,307	121,599	
Grand total		*8,503,531*	*23,528,357*	*1,884,868*	*93,614,540*	*929,623*

[a] Carabaos.
[b] Number of domesticated elephants returned as 4,072.
[c] Excluding animals owned by natives.
[d] Estimate for 1909.
[e] Data for 1908.
[f] Not including animals in the public service.
[g] On sugar estates only.
[h] Official estimate furnished by the French embassy to the United States under date of May 4, 1906.
[i] Animals assessed for tribute and tax.
[j] Including mules.
[k] On December 31, 1904.
[l] On December 31 of preceding year.
[m] Including goats owned by Maoris.

International trade in hides and skins.[a]

[Substantially the international trade of the world. This table gives the classification as found in the original returns, and the summary statements for "All countries" represent the total for each class only so far as it is disclosed in the original returns.]

EXPORTS.

Country.	Year beginning—	Kind of hides and skins.	1904.	1905.	1906.	1907.	1908.
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Argentina	Jan. 1	Cattle, dried	50,466,002	53,457,674	51,149,435	45,755,984	64,790,653
		do., salted	64,809,273	90,239,588	72,476,948	74,119,129	77,440,822
		Goat	3,961,693	4,205,350	4,164,487	2,002,001	5,089,831
		Horse, dried	2,152,791	2,801,828	680,007	2,214,675	2,577,159
		do., salted	4,591,961	1,731,726	3,507,399	488,096	358,628
		Kid	1,049,508	971,729	944,222	871,031	677,099
		Sheep	81,571,014	66,535,492	52,428,116	54,449,234	61,634,593
Austria-Hungary	Jan. 1	Calf, dried	6,139,211	6,855,933	4,092,440	4,249,850	4,709,293
		do., salted	6,623,787	9,100,680	8,290,261	11,650,104	18,618,474
		Cattle, dried	6,274,354	5,676,240	6,442,126	6,570,214	7,044,208
		do., salted	9,172,109	13,682,766	9,728,115	11,133,562	18,017,273
		Goat	2,542,591	1,977,987	2,542,150	2,346,820	2,609,391
		Horse, dried	1,033,747	2,297,437	1,821,679	777,570	1,505,757
		do., salted	2,495,853	3,808,485	3,490,578	2,417,148	2,602,115
		Kid	2,120,626	1,836,000	1,213,203	830,040	1,310,648
		Lamb	3,187,442	3,535,111	3,538,859	2,358,284	3,113,588
		Sheep	3,575,676	4,251,393	5,061,371	3,887,630	3,217,866
		Hides and skins, unclassified	....	....	....	1,263,248	1,195,126
Belgium	Jan. 1	....do	90,367,454	101,081,934	102,400,208	97,433,761	113,411,973
Brazil	Jan. 1	Deer	262,167	176,295	195,559	215,636	251,362
		Goat	5,556,633	3,361,740	3,842,815	4,998,211	5,685,720
		Hides, dried, not elsewhere specified	23,845,672	17,328,272	21,667,230	15,325,249	15,6[illegible],998
		do., salted, not elsewhere specified	48,004,782	42,135,260	50,567,124	54,149,306	51,398,557
		Horse	245,716	28,936	18,660	1,162	2,802
		Lamb	289,196	5,143	64,218	23,140	207,151
		Sheep	1,042,429	959,755	869,285	1,076,927	1,675,341
		Hides and skins, unclassified	28,911	33,113	54,227	60,504	35,344
British India	Jan. 1	Hides, unclassified	78,344,336	94,061,280	126,917,238	89,685,904	80,082,912
		Goat } Skins, unclassified }	38,581,900				
		Goat		40,191,648	49,057,568	32,639,040	41,339,200
		Skins, unclassified		14,994,861	9,473,968	4,320,624	2,115,792
British South Africa[b]	Jan. 1	Calf	90,391	96,562	67,841	47,046	16,419
		Cattle	2,049,386	2,970,438	4,566,062	7,423,557	9,357,295
		Goat	4,928,951	5,461,295	5,208,577	6,611,384	6,920,990
		Sheep	11,602,058	11,713,890	14,523,317	17,817,237	19,302,241
		Hides, not elsewhere specified	637	....	....	....	....
Canada[c]	Jan. 1	Sheep	352,000	242,000	247,000	293,000	37,000
		Hides and skins, not elsewhere specified	27,000,000	31,000,000	33,000,000	33,000,000	42,000,000
China	Jan. 1	Hides and skins, unclassified	37,330,133	51,043,990	56,615,924	65,377,054	52,148,742

Cuba	Jan. 1	Cattle	2,438,844	4,622,643	6,957,223	4,437,849	d 4,437,849
		Hides and skins, unclassified	52,482	198,299	207,823	3,370,215	d 3,370,215
Denmark	Jan. 1	....do	16,166,351	19,345,629	18,442,353	16,509,849	19,318,430
Dutch East Indies	Jan. 1	....do	13,940,625	14,039,571	15,276,088	15,796,758	d 15,796,758
Egypt	Jan. 1	Cattle and calf	6,841,357	4,547,315	5,748,384	4,944,008	5,031,305
		Sheep and goat c	1,084,797	2,620,849	3,196,993	3,686,466	2,587,329
France	Jan. 1	Calf	21,348,790	17,430,187	23,497,743	29,349,251	28,014,132
		Goat	7,613,556	10,333,449	8,400,492	6,118,708	6,062,490
		Kid	875,649	626,944	937,846	426,594	807,333
		Lamb	1,090,486	1,446,190	1,324,978	1,040,361	1,403,462
		Large	53,066,971	61,880,962	69,136,285	71,435,485	65,527,539
		Sheep	9,047,394	10,009,143	11,967,350	14,950,644	12,376,307
		Hides and skins, unclassified	3,035,932	7,776,412	6,723,877	2,388,928	2,510,183
Germany f	Jan. 1	Calf, green	8,618,308	10,235,610	16,865,579	17,197,595	22,823,349
		do., dried	9,228,989	9,504,125			
		Cattle, green	65,279,298	65,859,114	80,434,531	77,366,579	92,967,587
		do., dried	9,416,161	11,561,256			
		Goat, with hair on	4,021,451	3,744,110	3,198,907	1,949,106	2,633,862
		do., without hair	15,432	19,401			
		Horse, green	8,345,156	16,149,958	18,055,854	11,701,472	12,673,490
		do., dried	1,782,878	1,629,216			
		Sheep	385,147	823,206	4,766,834	5,472,754	5,125,967
		Hides and skins, unclassified	698,865	604,507	606,630	563,722	284,176
Italy	Jan. 1	Cattle and calf	23,639,941	19,357,463	25,858,232	24,820,296	35,327,084
		Sheep and goat	4,125,950	4,616,038	4,502,500	3,541,726	4,815,996
		Hides and skins, unclassified	695,338	2,737,700	910,729	1,609,595	1,474,672
Korea	Jan. 1	Cattle	4,755,600	2,273,200	2,209,733	2,423,600	d 2,423,600
Mexico	Jan. 1	Alligator	229,777	134,952	179,081	190,627	329,018
		Cattle	11,841,898	14,392,088	18,087,442	17,930,676	19,811,681
		Deer	619,358	572,190	730,660	802,260	734,196
		Goat	5,711,186	6,356,232	7,634,630	6,649,277	7,817,338
		Sheep	1,777	935	17,428	40,698	14,158
Netherlands	Jan. 1	Hides, dried	23,647,466	22,724,931	24,050,349	19,844,098	18,703,003
		do., fresh	301,548	236,435	237,965	165,450	149,756
		do., salted	31,865,968	32,383,298	34,507,035	32,386,777	36,715,553
		Sheep	2,708,125	1,064,492	1,322,985	1,520,636	2,651,278
New Zealand	Jan. 1	Hides, unclassified c	1,042,000	1,926,000	2,555,000	3,471,000	3,398,000
		Sheep	12,833,612	12,590,222	14,364,574	16,158,949	14,462,904
		Skins, unclassified	30,000	103,000	276,000	440,000	281,000
Peru	Jan. 1	Hides and skins, unclassified	6,717,760	6,954,866	7,941,310	6,339,384	d 6,339,384
Russia	Jan. 1	Hides, large	16,666,202	14,284,165	31,578,585	15,103,890	7,330,898
		do., small	24,406,908	24,540,778	26,235,263	24,572,738	23,364,962
		Sheep and goats	22,220,675	19,206,232	35,616,899	25,956,761	14,589,571
		Hides and skins, unclassified	.....	.....	.....	2,033,078	216,677
Singapore	Jan. 1	Hides, unclassified	6,919,733	7,268,133	7,510,800	6,524,667	d 6,524,667

a See "General note," p. 442.
b Cape Colony before 1906.
c Estimated.
d Year preceding.
e Number of pounds computed from stated number of hides and skins.
f Not including free ports prior to March 1, 1906.

International trade in hides and skins—Continued.

EXPORTS—Continued.

Country.	Year beginning—	Kind of hides and skins.	1904.	1905.	1906.	1907.	1908.
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Spain	Jan. 1	Goat	2,014,515	1,748,702	1,017,973	1,733,772	1,976,426
		Sheep	6,305,843	8,383,804	8,042,360	5,436,053	5,243,085
		Hides and skins, unclassified	5,965,921	9,359,902	12,536,488	7,595,300	6,925,882
Sweden	Jan. 1	do	12,647,729	15,709,468	16,247,694	13,230,260	14,953,738
Switzerland	Jan. 1	Hides, unclassified	11,750,194	12,095,438	13,414,023	14,900,599	16,235,057
		Skins, unclassified	5,544,404	6,062,490	5,744,584	6,713,735	7,115,858
United Kingdom	Jan. 1	Hides, unclassified	21,128,464	29,427,328	31,359,776	21,690,144	27,167,728
		Skins, unclassified[a]	49,864,593	46,964,937	37,835,419	35,403,044	22,841,466
United States	Jan. 1	Hides and skins, unclassified	24,514,226	8,654,522	16,025,299	11,126,157	14,914,057
Uruguay	July 1	Calf	2,074,665	1,795,344	3,243,609	2,500,131	[b] 2,500,131
		Cattle, dried	13,852,273	14,056,903	15,997,943	12,318,137	20,747,715
		do., salted[a]	41,159,472	30,875,494	24,357,872	23,310,784	22,812,832
		Goat	9,539	34	4,588	74	[b] 74
		Horse, dried[a]	1,607,872	515,104	430,896	247,968	313,536
		do., salted[a]	504,196	124,608	60,544	225,016	117,172
		Lamb	406,598	346,719	294,330	220,037	[b] 220,037
		Sheep	16,033,901	14,990,823	13,795,738	14,644,643	[b] 14,644,643
Venezuela	July 1	Cattle	7,624,535	7,929,730	6,399,486	4,362,636	7,084,950
		Deer	....	349,459	349,459	340,890	438,777
		Goat	1,446,752	1,479,815	1,402,444	1,543,478	1,816,262
Other countries	....	Hides:					
		Cattle, including buffalo	12,706,880	46,832,873	36,232,222	30,604,656	[c] 35,341,088
		Horse	348,784	471,232	507,364	477,873	[c] 378,660
		Large, not otherwise classified	6,198,614	303,172	....	14,733,890	[c] 14,733,890
		Small, not otherwise classified	1,915,667	....	....	1,871,942	[c] 1,871,942
		Unclassified	8,906,979	14,384,816	1,867	8,725,045	[c] 7,718,663
		Skins:					
		Calf	2,183,255	2,435,640	2,443,922	3,731,792	[c] 3,206,614
		Deer	1,372,026	859,467	17,761,809	18,384,224	[c] 18,141,090
		Goat	4,427,066	8,010,735	6,324,174	10,408,252	[c] 10,068,363
		Kid	40,836	1,040,412	580,236	463,340	[c] 1,024,899
		Sheep	2,942,913	11,014,904	10,441,862	17,887,219	[c] 13,668,121
		Sheep and goat, mixed	8,084,693	19,280,233	3,551,489	7,428,674	[c] 9,075,174
		Unclassified	66,311	5,805,481	1,275,344	7,396,730	[c] 9,443,051
		Hides and skins, unclassified	5,393,110	8,597,283	46,160,034	22,727,622	[c] 19,286,772
Total	....	....	1,346,115,847	1,489,099,169	1,586,841,835	1,482,866,006	1,561,400,325

RECAPITULATION.

All countries		Hides:					
		Cattle, including buffalo	301,846,085	364,430,009	335,039,138	317,757,363	382,277,553
		Cattle and calf, mixed	30,481,298	23,904,778	31,606,616	29,764,304	40,358,389
		Horse	23,110,731	29,559,465	28,572,981	18,550,980	20,529,319
		Large, not otherwise classified	75,931,787	76,468,299	100,714,870	101,273,265	87,592,327
		Small, not otherwise classified	26,322,575	24,540,778	26,235,263	26,444,680	25,236,924
		Unclassified	255,757,779	273,971,191	312,788,407	266,868,239	263,737,924
		Skins:					
		Alligator	229,777	134,952	179,081	190,627	329,018
		Calf	56,307,386	57,557,376	58,777,451	68,725,769	79,888,412
		Deer	2,254,451	1,957,411	19,037,487	19,743,010	19,565,425
		Goat	42,249,365	86,890,798	92,798,805	77,060,123	92,019,947
		Kid	4,086,619	4,475,094	3,675,507	2,591,005	3,819,979
		Lamb	4,979,722	5,333,163	5,222,385	3,641,822	4,944,238
		Sheep	148,400,112	143,187,824	137,848,220	153,941,624	154,053,504
		Sheep and goat, mixed	35,616,115	45,723,352	46,867,881	41,613,627	31,068,070
		Unclassified	55,475,446	58,832,622	44,909,518	54,274,133	41,797,167
		Hides and skins, unclassified	283,136,737	292,132,057	342,568,225	300,425,435	314,182,129
Total			1,346,115,847	1,489,099,169	1,586,841,835	1,482,866,006	1,561,400,325

IMPORTS.

Austria-Hungary	Jan. 1	Calf, dried	1,496,718	1,056,896	1,641,782	1,608,492	912,714
		do., green	1,449,759	994,505	1,795,444	1,804,449	1,959,468
		Cattle, dried	29,398,855	25,180,311	43,766,156	36,294,251	25,654,745
		do., green	27,347,454	17,540,414	31,964,594	27,210,106	30,158,788
		Goat	1,588,430	1,410,076	1,279,563	1,243,407	1,052,268
		Horse, dried	560,856	360,676	494,496	59,304	64,816
		do., green	153,662	224,871	500,670	630,301	409,178
		Kid	1,046,093	723,557	638,899	570,997	554,903
		Lamb	10,328,434	8,602,435	10,561,242	7,591,616	10,355,110
		Sheep	5,041,309	5,061,592	6,890,767	4,843,334	4,138,737
		Hides and skins, unclassified				859,903	698,645
Belgium	Jan. 1	Hides, green	122,539,211	135,911,437	142,197,407	137,852,633	151,932,264
British India	Jan. 1	Hides, unclassified	11,738,210	9,433,956	9,522,643	10,729,319	9,767,159
		Skins, unclassified	4,830,536	4,444,104	5,274,370	4,934,900	9,022,671
Canada	Jan. 1	Hides and skins, unclassified	(d)	(d)	(d)	(d)	28,650,646
Denmark	Jan. 1	do	6,962,196	7,848,454	10,294,482	9,504,125	8,744,633
Finland	Jan. 1	Hides, dried	1,869,515	1,898,433	2,631,124	2,698,193	2,504,411
		do., green	5,780,115	4,263,421	5,529,691	6,237,272	3,593,518
		Sheep	89,521	56,061	68,050	163,285	b 163,285
France	Jan. 1	Calf	7,090,953	7,980,756	9,035,423	6,593,583	7,153,037
		Goat	17,899,172	23,110,243	23,276,399	19,772,593	19,444,768
		Kid	4,372,843	4,544,123	4,935,708	3,798,564	4,724,946
		Lamb	370,533	378,553	374,565	251,327	254,854
		Large	85,214,668	98,515,340	106,831,132	97,557,830	87,812,960
		Sheep	2,630,226	2,532,200	3,291,372	3,160,105	5,825,493
		Hides and skins, unclassified	2,063,720	3,209,189	1,674,851	1,445,791	1,696,898

a Number of pounds computed from stated number of hides or skins. b Year preceding. c Preliminary. d No data.

International trade in hides and skins—Continued.

IMPORTS—Continued.

Country.	Year beginning—	Kind of hides and skins.	1904.	1905.	1906.	1907.	1908.
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Germany b	Jan. 1	Buffalo	(a)	(a)	(a)	2,927,077	2,640,255
		Calf, dried	21,104,405	22,145,869	18,811,819	14,672,421	14,243,622
		do., green	24,738,945	32,244,140	38,531,942	39,555,328	50,069,621
		Cattle, dried	63,954,541	70,228,234	77,797,563	74,161,500	68,589,538
		do., green	152,057,850	143,851,586	177,694,958	161,336,884	172,921,731
		Goat, with hair on	11,272,453	11,042,952	14,543,450	11,691,390	15,106,731
		do., without hair	61,068	38,140			
		Horse, dried	4,666,964	4,592,889	6,688,823	5,081,433	3,193,615
		do., green	27,629,866	25,891,742	30,573,918	21,788,279	18,303,213
		Lamb	(a)	(a)	(a)	308,427	130,073
		Sheep	1,126,562	746,485	1,345,040	808,435	1,730,187
		Hides and skins, unclassified	3,515,711	3,340,443	2,157,002	1,864,008	1,706,818
Greece	Jan. 1	*Hides, unclassified*	7,004,659	6,055,809	5,286,300	5,587,396	5,535,946
Italy	Jan. 1	Calf	42,876,591	39,240,949	44,294,383	2,207,708	2,596,824
		Cattle				38,113,505	40,243,390
		Sheep	9,997,520	8,740,884	11,596,532	8,082,806	6,738,868
		Goat				301,37[illegible]	783,302
		Kid	(a)	(a)	(a)	71,650	115,302
		Lamb	(a)	(a)	(a)	661,166	216,935
		Hides and skins, unclassified	89,287	181,881	277,782	108,433	643,529
Japan	Jan. 1	Cattle	9,871,720	7,402,046	5,450,564	8,365,319	5,588,303
		Deer	373,908	426,217	700,708	751,884	675,809
Netherlands	Jan. 1	Hides, dried	28,190,550	29,700,509	30,643,584	29,418,436	27,211,[illegible]
		do., fresh	1,080	15,141	5,404	9,090	15,653
		do., salted	25,207,165	21,586,003	27,913,694	29,705,512	26,239,687
		Sheep	2,084,239	2,367,808	2,094,329	3,226,381	4,030,276
Norway	Jan. 1	Hides and skins, unclassified	6,890,458	8,722,270	10,507,625	10,191,328	11,209,643
Portugal	Jan. 1	Hides, dried	5,829,003	4,216,487	5,227,560	5,404,596	5,681,948
		do., green	243,906	181,630	152,868	142,037	105,670
		do. not elsewhere specified	825	414	15,249	496	c 496
Roumania	Jan. 1	Buffalo	39,361	83,987	7,512,516	6,301,669	c 6,301,669
		Cattle	2,444,346	2,252,962			
		Calf	13,406	13,728	33,363	50,523	c 50,523
		Sheep, lamb, and goat	400,000	157,536	700,517	653,212	c 653,212
		Hides and skins, unclassified	163,705	136,312	65,949	10,100	c 10,100
Russia	Jan. 1	Hides, dry	10,412,368	12,668,515	10,147,336	10,633,089	10,292,148
		do., green	48,128,842	51,753,326	45,639,682	59,806,336	83,420,568
		Goat and kid	....	....	1,694,232	1,795,384	1,011,158
		Sheep	....	....	....	7,841,353	1,119,497
Singapore	Jan. 1	*Hides, unclassified*	10,554,133	8,191,200	9,230,000	8,492,933	c 8,492,933
Spain	Jan. 1	Hides and skins, unclassified	17,857,559	14,247,484	17,281,585	17,299,011	18,396,367
Sweden	Jan. 1	Hides and skins, unclassified	19,782,796	18,939,762	21,290,081	20,360,265	17,034,689

United Kingdom	Jan. 1	Goat,[d]	5,517,000	3,757,000	9,330,000	7,931,000	7,733,000
		Hides, unclassified	61,636,848	60,623,848	70,061,696	70,407,232	82,058,032
		Sheep [d]	34,490,000	34,694,000	42,124,000	[e] 6,675,000	[e] 403,000
		Hides and skins, unclassified	1,387,000	378,000	1,135,000	568,000	([f])
United States	Jan. 1	Cattle	91,686,817	136,612,360	144,040,983	122,932,034	137,922,575
		Goat	95,447,448	102,940,811	109,232,719	86,252,338	75,857,983
		Sheep [g]					20,136,987
		Hides and skins, unclassified	113,690,977	141,587,241	145,253,161	146,363,578	94,527,337
Other countries		Hides:					
		Cattle	7,289,141	7,143,387	8,324,330	8,595,547	[h] 9,330,419
		Horse			5,543	15,006	[h] 10,926
		Large, not otherwise classified	1,054,916	328,180		229,212	[h] 229,212
		Small, not otherwise classified	17,239	9,368,570		1,700	[h] 1,700
		Unclassified	4,932,465		3,665,524	17,282,573	[h] 18,021,728
		Skins:					
		Calf	153,261	128,604	131,676	100,950	[h] 23,702
		Deer	21,014				
		Goat	452,838	665,581	601,551	441,129	[h] 439,425
		Kid			23,316	12,301	[h] 4,585
		Sheep	1,534,647	741,964	1,199,522	802,674	[h] 1,056,530
		Sheep and goat, mixed	10,416	3,849	57,770	431	[h] 72,165
		Unclassified	1,277,800	2,003,073	1,806,172	9,272,110	[h] 9,654,782
		Hides and skins, unclassified	1,179,409	898,578	7,708,879	5,229,207	[h] 1,044,027
Total			1,332,226,177	1,418,566,968	1,595,595,210	1,471,494,864	1,508,851,386
RECAPITULATION.							
All countries		Hides:					
		Buffalo	39,361	83,967		2,927,077	2,640,255
		Cattle	384,050,724	410,211,290	486,551,684	453,310,815	496,711,158
		Cattle and calf, mixed	42,876,591	39,240,949	44,204,383		
		Horse	33,011,370	31,073,668	38,203,450	27,574,383	21,981,748
		Large, not otherwise classified	86,269,604	98,843,520	106,831,132	97,787,042	58,042,172
		Small, not otherwise classified	17,289	355,873,699	368,475,962	1,700	1,700
		Unclassified	344,086,895			385,477,143	434,873,597
		Skins:					
		Calf	56,047,447	64,564,498	69,981,449	66,653,454	77,019,571
		Deer	394,922	426,217	700,708	751,884	675,809
		Goat	132,238,409	142,964,803	159,901,614	129,428,553	121,428,631
		Kid	5,418,936	5,367,680	5,654,223	4,453,512	5,399,736
		Lamb	10,698,967	8,980,968	10,935,807	8,912,536	10,956,972
		Sheep	46,996,504	46,200,110	56,923,040	35,603,373	45,344,860
		Sheep and goat, mixed	10,407,936	8,902,289	12,354,819	653,643	725,377
		Unclassified	6,108,336	6,447,177	7,080,542	14,207,100	15,677,453
		Hides and skins, unclassified	173,582,886	199,486,133	217,646,397	213,852,649	184,372,332
Total			1,332,226,177	1,418,566,968	1,595,595,210	1,471,494,864	1,509,851,386

[a] No data.
[b] Not including free ports prior to March 1, 1906.
[c] Year preceding.
[d] Number of pounds computed from stated number of hides and skins.
[e] Pickled sheepskins only. Sheepskins with wool left on are stated in weight since 1906, and not included
[f] Excess of foreign exports over general imports, 664,460 pounds.
[g] Included in "Hides and skins, unclassified," prior to July 1, 1908.
[h] Preliminary.

FARM ANIMALS AND THEIR PRODUCTS IN CONTINENTAL UNITED STATES.

HORSES AND MULES.

Number and farm value of horses and mules on farms in the United States, 1867–1910.

January 1—	Horses.			Mules.		
	Number.	Price per head Jan. 1.	Farm value Jan. 1.	Number.	Price per head Jan. 1.	Farm value Jan. 1.
1867	5,401,000	$59.05	$318,924,000	822,000	$66.94	$55,048,000
1868	5,757,000	54.27	312,416,000	856,000	56.04	47,954,000
1869	6,333,000	62.57	396,222,000	922,000	79.23	73,027,000
1870	8,249,000	67.43	556,251,000	1,180,000	90.42	106,654,000
1871	8,702,000	71.14	619,039,000	1,242,000	91.98	114,272,000
1872	8,991,000	67.41	606,111,000	1,276,000	87.14	111,222,000
1873	9,222,000	66.39	612,273,000	1,310,000	85.15	111,546,000
1874	9,334,000	65.15	608,073,000	1,339,000	81.35	108,953,000
1875	9,504,000	61.10	580,708,000	1,394,000	71.89	100,197,000
1876	9,735,000	57.29	557,747,000	1,414,000	66.46	94,001,000
1877	10,155,000	55.83	567,017,000	1,444,000	64.07	92,482,000
1878	10,330,000	56.63	584,999,000	1,638,000	62.03	101,579,000
1879	10,939,000	52.36	572,712,000	1,713,000	56.00	95,942,000
1880	11,202,000	54.75	613,297,000	1,730,000	61.26	105,948,000
1881	11,430,000	58.44	667,954,000	1,721,000	69.79	120,096,000
1882	10,522,000	58.53	615,825,000	1,835,000	71.35	130,945,000
1883	10,838,000	70.59	765,041,000	1,871,000	79.49	148,732,000
1884	11,170,000	74.64	833,734,000	1,914,000	84.22	161,215,000
1885	11,565,000	73.70	852,283,000	1,973,000	82.38	162,497,000
1886	12,078,000	71.27	860,823,000	2,053,000	79.60	163,381,000
1887	12,497,000	72.15	901,686,000	2,117,000	78.91	167,058,000
1888	13,173,000	71.82	946,096,000	2,192,000	79.78	174,854,000
1889	13,663,000	71.89	982,195,000	2,258,000	79.49	179,444,000
1890	14,214,000	68.84	978,517,000	2,331,000	78.25	182,394,000
1891	14,057,000	67.00	941,823,000	2,297,000	77.88	178,847,000
1892	15,498,000	65.01	1,007,594,000	2,315,000	75.55	174,882,000
1893	16,207,000	61.22	992,225,000	2,331,000	70.68	164,764,000
1894	16,081,000	47.83	769,225,000	2,352,000	62.17	146,233,000
1895	15,893,000	36.29	576,731,000	2,333,000	47.55	110,928,000
1896	15,124,000	33.07	500,140,000	2,279,000	45.29	103,204,000
1897	14,365,000	31.51	452,649,000	2,216,000	41.66	92,302,000
1898	13,961,000	34.26	478,362,000	2,190,000	43.88	96,110,000
1899	13,665,000	37.40	511,075,000	2,134,000	44.96	95,963,000
1900	13,538,000	44.61	603,969,000	2,086,000	53.55	111,717,000
1901	16,745,000	52.86	885,200,000	2,864,000	63.97	183,232,000
1902	16,531,000	58.61	968,935,000	2,757,000	67.61	186,412,000
1903	16,557,000	62.25	1,030,706,000	2,728,000	72.49	197,753,000
1904	16,736,000	67.93	1,136,940,000	2,758,000	78.88	217,533,000
1905	17,058,000	70.37	1,200,310,000	2,889,000	87.18	251,840,000
1906	18,719,000	80.72	1,510,890,000	3,404,000	98.31	334,681,000
1907	19,747,000	93.51	1,846,578,000	3,817,000	112.16	428,064,000
1908	19,992,000	93.41	1,867,530,000	3,869,000	107.76	416,939,000
1909	20,640,000	95.64	1,974,052,000	4,053,000	107.84	437,082,000
1910	21,040,000	108.19	2,276,363,000	4,123,000	119.84	494,095,000

HORSES AND MULES—Continued.

Number, average price, and farm value of horses and mules on farms in the United States January 1, 1910.

State, Territory, or Division.	Horses.			Mules.		
	Number	Average price per head Jan. 1.	Farm value Jan. 1.	Number	Average price per head Jan. 1.	Farm value Jan. 1.
Maine	119,000	$125.00	$14,875,000			
New Hampshire	59,000	106.00	6,254,000			
Vermont	*94,000*	*106.00*	*9,964,000*			
Massachusetts	84,000	128.00	10,752,000			
Rhode Island	14,000	129.00	1,806,000			
Connecticut	62,000	126.00	7,812,000			
New York	717,000	125.00	89,625,000	4,000	$132.00	$528,000
New Jersey	103,000	134.00	13,802,000	5,000	155.00	775,000
Pennsylvania	619,000	132.00	81,708,000	43,000	145.00	6,235,000
North Atlantic	1,871,000	126.46	236,598,000	52,000	144.96	7,538,000
Delaware	38,000	106.00	4,028,000	6,000	125.00	750,000
Maryland	160,000	108.00	17,280,000	20,000	130.00	2,600,000
Virginia	323,000	107.00	34,561,000	54,000	130.00	7,020,000
West Virginia	197,000	112.00	22,064,000	12,000	120.00	1,440,000
North Carolina	192,000	121.00	23,232,000	181,000	137.00	24,797,000
South Carolina	87,000	127.00	11,049,000	144,000	158.00	22,752,000
Georgia	141,000	125.00	17,625,000	248,000	157.00	38,936,000
Florida	55,000	109.00	5,995,000	21,000	155.00	3,255,000
South Atlantic	1,193,000	113.86	135,834,000	686,000	148.03	101,550,000
Ohio	977,000	129.00	126,033,000	22,000	125.00	2,750,000
Indiana	*847,000*	*122.00*	*103,334,000*	*94,000*	*126.00*	*11,844,000*
Illinois	1,655,000	124.00	205,220,000	152,000	131.00	19,912,000
Michigan	740,000	126.00	93,996,000	4,000	122.00	488,000
Wisconsin	669,000	121.00	80,949,000	5,000	115.00	575,000
North Central E. Miss. R.	4,894,000	124.55	609,532,000	277,000	128.41	35,569,000
Minnesota	767,000	111.00	85,137,000	9,000	114.00	1,026,000
Iowa	1,447,000	120.00	173,640,000	47,000	123.00	5,781,000
Missouri	1,005,000	103.00	103,515,000	344,000	119.00	40,936,000
North Dakota	712,000	114.00	81,168,000	8,000	130.00	1,040,000
South Dakota	612,000	105.00	64,260,000	10,000	121.00	1,210,000
Nebraska	1,045,000	108.00	112,860,000	72,000	119.00	8,568,000
Kansas	1,187,000	107.00	127,009,000	154,000	116.00	17,864,000
North Central W. Miss. R.	6,775,000	110.35	747,589,000	644,000	118.67	76,425,000
Kentucky	407,000	105.00	42,735,000	207,000	118.00	24,426,000
Tennessee	324,000	112.00	36,288,000	290,000	123.00	35,670,000
Alabama	*171,000*	*95.00*	*16,245,000*	*253,000*	*122.00*	*30,866,000*
Mississippi	265,000	85.00	22,525,000	290,000	113.00	32,770,000
Louisiana	233,000	79.00	18,407,000	178,000	116.00	20,648,000
Texas	1,369,000	73.00	99,937,000	702,000	*99.00*	69,498,000
Oklahoma	804,000	81.00	65,124,000	191,000	105.00	20,055,000
Arkansas	290,000	82.00	23,780,000	215,000	109.00	23,435,000
South Central	3,863,000	84.14	325,041,000	2,326,000	110.65	257,368,000
Montana	319,000	80.00	25,520,000	5,000	102.00	510,000
Wyoming	148,000	83.00	12,284,000	2,000	106.00	212,000
Colorado	280,000	85.00	23,800,000	12,000	105.00	1,260,000
New Mexico	133,000	47.00	6,251,000	8,000	79.00	632,000
Arizona	115,000	62.00	7,130,000	6,000	108.00	648,000
Utah	130,000	85.00	11,050,000	3,000	80.00	240,000
Nevada	98,000	78.00	7,644,000	4,000	79.00	316,000
Idaho	163,000	*102.00*	*16,626,000*	2,000	*116.00*	*232,000*
Washington	330,000	108.00	35,640,000	5,000	121.00	605,000
Oregon	308,000	103.00	31,724,000	8,000	108.00	864,000
California	*420,000*	*105.00*	*44,100,000*	83,000	122.00	*10,126,000*
Far Western	2,444,000	90.74	221,769,000	138,000	113.37	15,645,000
United States	21,040,000	108.19	2,276,363,000	4,123,000	119.84	494,095,000

HORSES AND MULES—Continued.

Imports, exports, and average prices of horses and mules, 1892–1909.

Year ending June 30—	Imports of horses.			Exports of horses.			Exports of mules.		
	Number.	Value.	Average import price.	Number.	Value.	Average export price.	Number.	Value.	Average export price.
1892	14,074	$2,455,868	$174.50	3,226	$611,188	$189.46	1,965	$238,591	$121.42
1893	15,451	2,388,267	154.57	2,967	718,607	242.20	1,634	210,278	128.69
1894	6,166	1,319,572	214.01	5,246	1,108,995	211.40	2,063	240,961	116.80
1895	13,098	1,055,191	80.56	13,984	2,209,298	157.99	2,515	186,452	74.14
1896	9,991	662,591	66.32	25,126	3,530,703	140.52	5,918	406,161	68.63
1897	6,998	464,808	66.42	39,532	4,769,265	120.64	7,473	545,331	72.97
1898	3,085	414,899	134.49	51,150	6,176,569	120.75	8,098	664,789	82.09
1899	3,042	551,050	181.15	45,778	5,444,342	118.93	6,755	516,908	76.52
1900	3,102	596,592	192.32	64,722	7,612,616	117.62	43,369	3,919,478	90.38
1901	3,785	985,738	260.43	82,250	8,873,845	107.89	34,405	3,210,267	93.31
1902	4,832	1,577,234	326.41	103,020	10,048,046	97.53	27,586	2,692,298	97.60
1903	4,999	1,536,296	307.32	34,007	3,152,159	92.69	4,294	521,725	121.47
1904	4,726	1,460,287	308.99	42,001	3,189,100	75.93	3,658	412,971	112.90
1905	5,180	1,591,083	307.16	34,822	3,175,259	91.19	5,826	645,464	110.79
1906	6,021	1,716,675	285.11	40,087	4,365,981	108.91	7,167	989,639	138.08
1907	6,080	1,978,105	325.35	33,882	4,359,957	131.99	6,781	850,901	125.48
1908	5,487	1,604,392	292.40	19,000	2,612,587	137.50	6,609	990,667	149.90
1909	7,084	2,007,276	283.35	21,616	3,386,617	156.67	3,432	472,017	137.53

CATTLE.

Imports, exports, and average prices of live cattle, 1892–1909.

Year ending June 30—	Imports.			Exports.		
	Number.	Value.	Average import price.	Number.	Value.	Average export price.
1892	2,168	$47,466	$21.89	394,607	$35,099,095	$88.95
1893	3,293	45,682	13.87	287,094	26,032,428	90.68
1894	1,592	18,704	11.75	359,278	33,461,922	93.14
1895	149,781	765,853	5.11	331,722	30,603,796	92.26
1896	217,826	1,509,856	6.93	372,461	34,560,672	92.79
1897	328,977	2,589,857	7.87	392,190	36,357,451	92.70
1898	291,589	2,913,223	9.99	439,255	37,827,500	86.12
1899	199,752	2,320,362	11.62	389,490	30,516,833	78.35
1900	181,006	2,257,694	12.47	397,286	30,635,153	77.11
1901	146,022	1,931,433	13.23	459,218	37,566,980	81.81
1902	96,027	1,608,722	16.75	392,884	29,902,212	76.11
1903	66,175	1,161,548	17.55	402,178	29,848,936	74.22
1904	16,056	310,737	19.35	593,409	42,256,291	71.21
1905	27,855	458,572	16.46	567,806	40,598,048	71.50
1906	29,019	548,430	18.90	584,239	42,081,170	72.03
1907	32,402	565,122	17.44	423,051	34,577,392	81.73
1908	92,356	1,507,310	16.32	349,210	29,339,134	84.02
1909	129,184	1,999,422	15.48	207,542	18,046,976	86.96

CATTLE—*Continued.*

Number and value of milch cows and other cattle on farms in the United States, 1867–1910.

January 1—	Milch cows.			Other cattle.		
	Number.	Price per head Jan. 1.	Farm value Jan. 1.	Number.	Price per head Jan. 1.	Farm value Jan. 1.
1867	8,349,000	$28.74	$239,947,000	11,731,000	$15.79	$185,254,000
1868	8,692,000	26.56	230,817,000	11,942,000	15.06	179,888,000
1869	9,248,000	29.15	269,610,000	12,185,000	18.73	228,183,000
1870	10,096,000	32.70	330,175,000	15,388,000	18.87	290,401,000
1871	10,023,000	33.89	339,701,000	16,212,000	20.78	336,860,000
1872	10,304,000	29.45	303,438,000	16,390,000	18.12	296,932,000
1873	10,576,000	26.72	282,559,000	16,414,000	18.06	296,448,000
1874	10,705,000	25.63	274,326,000	16,218,000	17.55	284,706,000
1875	10,907,000	25.74	280,701,000	16,313,000	16.91	275,872,000
1876	11,085,000	25.61	283,879,000	16,785,000	17.00	285,387,000
1877	11,261,000	25.47	286,778,000	17,956,000	15.99	287,156,000
1878	11,300,000	25.74	290,898,000	19,223,000	16.72	321,346,000
1879	11,826,000	21.71	256,721,000	21,408,000	15.38	329,254,000
1880	12,027,000	23.27	279,899,000	21,231,000	16.10	341,761,000
1881	12,369,000	23.95	296,277,000	20,939,000	17.33	362,862,000
1882	12,612,000	25.89	326,489,000	23,280,000	19.89	463,070,000
1883	13,126,000	30.21	396,575,000	28,046,000	21.81	611,549,000
1884	13,501,000	31.37	423,487,000	29,046,000	23.52	683,229,000
1885	13,905,000	29.70	412,903,000	29,867,000	23.25	694,383,000
1886	14,235,000	27.40	389,986,000	31,275,000	21.17	661,956,000
1887	14,522,000	26.08	378,790,000	33,512,000	19.79	663,138,000
1888	14,856,000	24.65	366,252,000	34,378,000	17.79	611,751,000
1889	15,299,000	23.94	366,226,000	35,032,000	17.05	597,237,000
1890	15,953,000	22.14	353,152,000	36,849,000	15.21	560,625,000
1891	16,020,000	21.62	346,398,000	36,876,000	14.76	544,128,000
1892	16,416,000	21.40	351,378,000	37,651,000	15.16	570,749,000
1893	16,424,000	21.75	357,300,000	35,954,000	15.24	547,882,000
1894	16,487,000	21.77	358,999,000	36,608,000	14.66	536,790,000
1895	16,505,000	21.97	362,602,000	34,364,000	14.06	482,999,000
1896	16,138,000	22.55	363,956,000	32,085,000	15.86	508,928,000
1897	15,942,000	23.16	369,240,000	30,508,000	16.65	507,929,000
1898	15,841,000	27.45	434,814,000	29,264,000	20.92	612,297,000
1899	15,990,000	29.66	474,234,000	27,994,000	22.79	637,931,000
1900	16,292,000	31.60	514,812,000	27,610,000	24.97	689,486,000
1901	16,834,000	30.00	505,093,000	45,500,000	19.93	906,644,000
1902	16,697,000	29.23	488,130,000	44,728,000	18.76	839,126,000
1903	17,105,000	30.21	516,712,000	44,659,000	18.45	824,055,000
1904	17,420,000	29.21	508,841,000	43,629,000	16.32	712,178,000
1905	17,572,000	27.44	482,272,000	43,669,000	15.15	661,571,000
1906	19,794,000	29.44	582,789,000	47,068,000	15.85	746,172,000
1907	20,968,000	31.00	645,497,000	51,566,000	17.10	881,557,000
1908	21,194,000	30.67	650,057,000	50,073,000	16.89	845,938,000
1909	21,720,000	32.36	702,945,000	49,379,000	17.49	863,754,000
1910	21,801,000	35.79	780,308,000	47,279,000	19.41	917,453,000

CATTLE—Continued.

Number, average price, and farm value of cattle on farms in the United States January 1, 1910.

State, Territory, or Division.	Milch cows.			Other cattle.		
	Number.	Average price per head Jan. 1.	Farm value Jan. 1.	Number.	Average price per head Jan. 1.	Farm value Jan. 1.
Maine	175,000	$33.00	$5,775,000	139,000	$16.90	$2,349,000
New Hampshire	122,000	36.20	4,416,000	93,000	20.30	1,888,000
Vermont	285,000	34.20	9,747,000	210,000	14.40	3,024,000
Massachusetts	192,000	42.00	8,064,000	88,000	16.70	1,470,000
Rhode Island	26,000	43.80	1,139,000	10,000	17.50	175,000
Connecticut	137,000	41.00	5,617,000	81,000	19.10	1,547,000
New York	1,771,000	39.50	69,954,000	889,000	18.20	16,180,000
New Jersey	190,000	47.50	9,025,000	82,000	21.40	1,755,000
Pennsylvania	1,140,000	39.00	44,460,000	917,000	19.20	17,606,000
North Atlantic	4,038,000	39.18	158,197,000	2,509,000	18.33	45,994,000
Delaware	38,000	38.00	1,444,000	22,000	21.00	462,000
Maryland	160,000	37.30	5,968,000	138,000	21.10	2,912,000
Virginia	297,000	29.70	8,821,000	578,000	19.40	11,213,000
West Virginia	247,000	35.00	8,645,000	511,000	22.50	11,498,000
North Carolina	297,000	25.50	7,574,000	449,000	12.50	5,612,000
South Carolina	140,000	28.90	4,046,000	227,000	12.00	2,724,000
Georgia	314,000	25.00	7,850,000	673,000	10.30	6,932,000
Florida	95,000	32.50	3,088,000	712,000	10.30	7,334,000
South Atlantic	1,588,000	29.87	47,436,000	3,310,000	14.71	48,687,000
Ohio	947,000	42.80	40,532,000	978,000	24.10	23,570,000
Indiana	687,000	41.00	28,167,000	1,020,000	24.50	24,990,000
Illinois	1,232,000	42.80	52,730,000	1,974,000	26.40	52,114,000
Michigan	936,000	39.50	36,972,000	963,000	18.50	17,816,000
Wisconsin	1,506,000	36.60	55,120,000	1,081,000	16.40	17,728,000
North Central E. Miss. R.	5,308,000	40.23	213,521,000	6,016,000	22.64	136,218,000
Minnesota	1,125,000	33.00	37,125,000	1,228,000	14.30	17,560,000
Iowa	1,570,000	36.00	56,520,000	3,611,000	22.20	80,164,000
Missouri	925,000	34.80	32,190,000	2,165,000	22.60	48,929,000
North Dakota	247,000	33.90	8,373,000	616,000	20.50	12,628,000
South Dakota	*656,000*	*33.00*	*21,648,000*	*1,341,000*	*21.50*	*28,832,000*
Nebraska	879,000	35.00	30,765,000	3,040,000	21.90	66,576,000
Kansas	737,000	36.90	27,195,000	3,260,000	23.70	77,262,000
North Central W. Miss. R.	6,139,000	34.83	213,816,000	15,261,000	21.75	331,951,000
Kentucky	394,000	32.70	12,884,000	665,000	19.90	13,234,000
Tennessee	321,000	27.50	8,828,000	565,000	13.80	7,797,000
Alabama	289,000	23.00	6,647,000	528,000	9.00	4,752,000
Mississippi	330,000	23.50	7,755,000	577,000	8.40	4,847,000
Louisiana	200,000	24.30	4,860,000	480,000	10.30	4,944,000
Texas	*1,137,000*	*29.50*	*33,542,000*	*7,131,000*	*15.30*	*109,104,000*
Oklahoma	355,000	31.50	11,182,000	1,637,000	19.20	31,430,000
Arkansas	361,000	22.00	7,942,000	600,000	9.00	5,400,000
South Central	3,387,000	27.65	93,640,000	12,183,000	14.90	181,508,000
Montana	80,000	46.50	3,720,000	842,000	27.40	23,071,000
Wyoming	27,000	43.70	1,180,000	959,000	26.40	25,318,000
Colorado	161,000	41.00	6,601,000	1,425,000	23.00	32,775,000
New Mexico	29,000	38.80	1,125,000	901,000	17.40	15,677,000
Arizona	*25,000*	*43.00*	*1,075,000*	*626,000*	*19.30*	*12,082,000*
Utah	88,000	34.00	2,992,000	327,000	18.30	5,984,000
Nevada	19,000	44.00	836,000	404,000	20.70	8,363,000
Idaho	81,000	41.40	3,353,000	340,000	21.40	7,276,000
Washington	205,000	41.80	8,569,000	358,000	19.90	7,124,000
Oregon	*174,000*	*39.60*	*6,890,000*	*698,000*	*18.50*	*12,913,000*
California	452,000	38.40	17,357,000	1,120,000	20.10	22,512,000
Far Western	1,341,000	40.04	53,698,000	8,000,000	21.64	173,095,000
United States	*21,801,000*	*35.79*	*780,308,000*	*47,279,000*	*19.41*	*917,453,000*

CATTLE—Continued.

Wholesale prices of cattle per 100 pounds, 1896-1909.

Date.	Chicago.		Cincinnati.		St. Louis.		Omaha.	
	Inferior to prime.		Fair to medium.		Good to choice native steers.		Native beeves.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1896	$1.75	$6.00	$3.00	$3.85	$3.00	$5.10	$3.00	$4.75
1897	1.75	5.75	3.00	4.00	3.25	5.25	3.00	5.20
1898	2.25	6.25	3.10	4.25	4.00	5.65	3.00	5.60
1899	2.00	7.00	3.00	4.50	4.00	6.00	3.75	7.25
1900	1.75	6.00	3.00	4.70	4.00	6.50	3.50	7.50
1901	2.10	7.00	2.90	5.65	4.75	8.25	3.50	7.25
1902	1.90	14.50	3.00	5.40	5.15	8.75	3.00	8.15
1903	1.50	8.35	2.25	4.40	5.00	6.00	2.65	5.75
1904	1.70	7.65	2.25	4.25	4.90	6.60	2.75	6.35
1905	1.85	7.00	2.35	4.75	5.15	7.10	3.05	6.50
1906.								
January	2.00	6.50	2.85	4.00	5.45	6.00	3.10	5.50
February	2.10	6.40	3.25	4.35	5.65	6.00	3.00	5.00
March	2.25	6.35	3.25	4.50	5.75	6.00	3.10	5.60
April	2.35	6.35	3.00	4.40	5.50	5.75	3.35	5.50
May	2.50	6.20	3.00	4.35	5.45	5.80	3.50	5.65
June	1.75	6.10	2.75	4.00	5.50	6.00	3.35	5.70
July	2.00	6.50	2.60	4.40	5.85	6.10	3.10	6.25
August	2.00	6.85	2.50	4.25	5.85	6.30	3.05	6.25
September	2.05	6.95	2.50	4.40	6.25	6.40	2.90	6.40
October	2.00	6.95	2.40	4.35	6.15	6.75	3.75	6.35
November	1.75	7.40	2.35	4.50	5.85	7.00	3.25	6.40
December	1.75	7.90	2.75	4.50	6.00	7.00	3.00	6.85
Year	1.75	7.90	2.35	4.50	5.45	7.00	2.90	6.85
1907.								
January	2.00	7.30	4.60	5.40	6.10	6.55	3.10	6.10
February	2.00	7.25	4.40	5.25	5.75	6.10	3.20	5.85
March	2.00	6.90	4.65	5.50	6.00	6.25	3.25	5.80
April	2.50	6.75	4.75	5.70	5.85	6.25	3.60	5.85
May	2.20	6.50	4.65	5.60	5.90	6.05	3.75	6.10
June	2.25	7.10	4.75	5.75	6.00	6.85	4.25	6.75
July	2.00	7.50	5.00	5.90	6.90	7.25	3.25	7.10
August	2.00	7.60	4.90	6.00	6.65	7.35	3.35	7.30
September	2.00	7.35	5.00	5.65	6.65	7.00	5.25	7.10
October	2.00	7.45	4.85	5.50	6.70	7.00	4.25	7.05
November	2.00	7.25	4.10	5.00	5.35	6.60	3.50	6.40
December	2.00	8.00	4.15	5.15	5.40	6.75	3.15	5.70
Year	2.00	8.00	4.10	6.00	5.35	7.35	3.10	7.30
1908.								
January	2.00	6.40	3.25	4.50	5.50	5.80	2.75	5.75
February	2.00	6.25	3.25	4.50	5.70	5.80	2.25	5.55
March	2.25	7.35	3.50	5.00	5.75	7.15	3.10	7.00
April	2.50	7.40	4.00	5.50	6.90	7.35	3.00	7.00
May	2.50	7.40	3.90	5.25	7.00	7.20	3.00	7.05
June	2.50	8.40	4.00	5.25	7.15	8.25	3.00	8.05
July	2.30	8.25	3.50	5.00	7.45	8.00	3.50	8.10
August	2.25	7.90	3.15	4.75	6.75	7.50	2.75	7.00
September	2.10	7.85	2.75	4.25	6.75	7.75	3.25	7.50
October	2.00	7.60	2.65	4.25	6.85	7.50	3.30	7.25
November	2.25	8.00	3.00	4.40	7.10	7.60	3.00	7.25
December	2.30	8.00	3.25	4.75	6.90	8.00	2.50	6.80
Year	2.00	8.40	2.65	5.50	5.50	8.25	2.25	8.10
1909.								
January	2.90	7.50	3.60	5.00	5.70	7.00	4.00	7.25
February	3.00	7.15	3.85	4.75	6.15	6.75	4.00	6.25
March	3.05	7.40	3.85	5.00	6.75	7.00	4.00	6.95
April	3.15	7.15	3.85	4.90	6.75	7.00	4.50	6.75
May	3.30	7.30	4.00	5.25	6.60	7.00	4.75	7.00
June	3.15	7.25	3.75	5.50	7.00	7.15	5.00	7.00
July	3.10	7.45	8.50	5.25	7.00	7.40	5.25	7.25
August	3.00	8.00	3.35	5.25	7.10	7.65	4.50	7.50
September	3.00	8.50	3.25	5.00	7.50	8.50	4.75	8.00
October	3.05	9.10	3.00	4.85	8.00	8.75	4.50	8.00
November	4.05	9.25	8.25	4.85	7.25	8.25	3.75	8.25
December	3.00	9.50	3.50	5.10	6.40	10.50	3.75	8.25
	2.90	9.50	3.00	5.50	5.70	10.50	3.75	8.25

BUTTER AND CHEESE.

Wholesale prices of butter and cheese per pound, 1896–1909.

Date.	Butter.								Cheese.							
	New York.		Cincinnati.		Chicago.		Elgin.		New York.		Cincinnati.		Chicago.		St. Louis.	
	Creamery extra.		Creamery.		Creamery firsts.		Creamery extra.		September, colored.		Factory.		Young Americas.a		Full cream.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.
1896	14	25	12	20	12	24	14	24½	6⅝	10¾	7	10	5½	10½	7¼	10½
1897	15	24	12	22	12½	23	13⅜	23	7⅝	12¼	7	11	3	11	8	11¾
1898	15	23½	13	20	14	22	15	22	6⅞	10½	7	11	3	11	8	10½
1899	16½	28	16	24	14	27	16	27	7½	13	8	12½	8	13	9	13
1900	17½	30	16	27	15½	29	18	29	9	13½	8½	12½	7	12¼	10	12¼
1901	18	25½	17	24	16	24½	18½	24½	8½	12½	8½	12	9	11¾	10	12
1902	19	33	17	27	16	31	19	30	9½	13½	10½	13	9½	13	10¾	14½
1903	19	20½	15½	27	10	28½	18½	29	10	15	10½	12¾	9	13¾	11½	14¾
1904	17½	28	17	28	15	28	17	28	7	12	8	10½	7½	11½	9	13¾
1905	17½	35½	19	34	18	34	19½	34	9	14½	10	14¼	10	14	11¼	15¾
1906.																
January	25	27½	25½	27	20	27	26	27	14	14½	12½	13½	...	13	13¼	13½
February	26	27½	26½	29½	22	27½	27	28½	14	14¼	13½	...	...	13	13¼	13¾
March	27	27½	27	28	21	27½	27	28½	14	14¼	13½	...	11½	13	13	13¾
April	21	25½	21	27	17	26½	21	26	14½	14¼	13½	...	11	12	12¼	13
May	19½	22	19	22	16½	20	19	21	9½	14½	11	13½	9½	11¾	11¼	12¼
June	19½	21	19½	21	16½	21	19½	20	9½	11	11	...	10½	11½	11⅜	12½
July	20½	21½	20	22½	18	20	20	21½	11	11½	11	...	11¼	11¾	12¼	12¾
August	21	24½	21½	24	18	23	21½	23	11½	12¼	12	13	12	12¾	12¾	14
September	24	25½	24	25½	20½	24	24	24½	12½	13	13	...	12¼	12½	13½	14
October	25½	27	24½	27	22	25½	24½	26	13¼	13½	13	13¾	12½	13¼	14	14½
November	27	30½	26	31	22	28½	26	30	13¼	14	13½	13¾	13	13¾	14¼	15¼
December	30½	33	30	32½	25	31	30	31½	14	14½	13½	14	13½	14	15¼	15¼
Year	19½	33	19	32½	16½	31	19	31½	9½	14½	11	14	9½	14	11¼	15¼
1907.																
January	28	33	29	33	22	31	29	32	14½	14½	14½	15	14	14½	16½	15¾
February	32½	34	32	34	23	32½	32	33	14½	14¾	14½	15	14¼	16	15	16¾
March	29¾	34	30	32	25	32½	30	32	14¾	15	15	15½	15	16	15	16¾

April	27	35	27	31	25	32½	27	33	15	15	15	15½	14½	15½	12¼	18
May	24½	27½	23	26	18	25	23	25	12	15	14	15½	14	15	15	15½
June	23½	25	23	24½	18	24	23	23	11¾	12½	13½	14	13	14	14	14½
July	24½	27	26	27	18	25	24	25	12¼	12¾	13½	14	13	13½	14¼	15
August	24½	26½	26	27½	20	25	24	26	12	13½	14	......	......	13½	14½	14½
September	26	29½	28	30½	21	28½	26	28½	13¾	14¾	14	......	13½	14½	14½	15½
October	26	30	29	32	22½	29½	27	30	11¾	16½	14	15½	14	15½	14½	16½
November	24½	28	26	29	20	27	24	27	15¼	15¾	15½	......	12½	15½	13½	14½
December	28	29½	29	31	21	29	27	29	15¼	15¾	15½	......	11½	13	13	14
Year	23½	35	23	34	18	32½	23	33	11¾	16¼	13½	15½	11½	16	12¼	16½
1908.																
January	29	32½	29	34½	24	31	29½	32	15¾	15¾	14½	16½	12½	13	14	14
February	30	34	32	36	26	33½	32	33	15	15¾	14½	16½	12¼	12¾	13¾	14
March	26	30	29	34½	25	31	29	31	15¾	16	14½	16½	12¼	13¾	14	14½
April	26½	30½	26½	32½	22	30	26½	30	14½	16	14½	16½	11	13¾	13	14½
May	21½	26½	22	28½	19	25	22	26	14½	15	14½	16½	11	12½	13	13
June	22	24	23	25½	20	23	23	23	10½	11½	12	16½	11½	12½	12½	13
July	22	23	22	25½	20	22½	22	23	9¾	12¼	12½	13½	11½	12	12½	14
August	21½	23½	21	25½	19	22½	21	23	11	12	12½	13½	12½	13	13½	14
September	23½	25½	23	28½	20	24	23	26	11	13	12½	14	12¾	13½	13¾	14½
October	26	27½	25½	30	21	27½	27½	27½	11¼	13	13½	14	13½	14	14¼	14½
November	27	31	27	32½	22	30	28	30	11¼	14	13½	15	13½	14½	14½	15
December	30½	33	29½	34½	25	31	30	32	11¾	14	14	15	14	14½	15	15¼
Year	21½	34	21	36	19	33½	21	33	9¾	16	12	16½	11	14½	13	15¼
1909.																
January	29	33	31	34	(b) 24	32	29	32	14	14	14	14½	14	16	15¼	16½
February	29	31½	31	32	24	30	29	30	14½	15	14½	15	14½	16	16½	16½
March	28½	30½	31	32	25	29	29	30	15	15¾	14½	15	15	16½	16	17
April	28	29½	28	30	24	29½	26	30	15	15¾	14½	16	14¾	16½	15½	16½
May	26	29½	26	29	22	27	24	27	12½	14	15	16	12½	15	15½	16½
June	25	26½	27	28½	23	27	25	26½	12½	13½	14½	15½	12½	13¾	14½	15½
July	25½	27	27½	28½	23	28	25½	26½	13	14	14½	......	13¼	15½	15	16½
August	26	29	28	31	23	28	26	29	14	15	14½	15	15	15½	16	16¾
September	29	31	32	......	25	29½	30	30	15½	15½	15	......	15	15½	16½	16¾
October	30	31½	32	33	26	30½	30	31	15½	16½	15	16½	15	16	16½	16½
November	30	32	32½	35	27½	31	30	32½	16½	16½	16	17	15¾	16¼	16¾	16¾
December	33	37	35½	38½	28½	35	33	36	16¾	17	16½	17	15¾	16¼	16¾	17
Year	25	37	26	38½	22	35	24	36	12¾	17	14	17	12½	16½	14¼	17

a Full cream, 1896 to 1900.

b Creamery firsts to extras.

BUTTER AND CHEESE—Continued.

International trade in butter, 1904–1908.[a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds*	*Pounds.*	*Pounds.*
Argentina	Jan. 1	11,672,157	11,890,040	9,712,076	6,691,980	7,825,681
Australia	Jan. 1	64,788,542	55,904,151	75,765,536	66,076,915	51,193,311
Austria-Hungary	Jan. 1	11,233,431	8,944,151	9,501,920	5,456,880	8,217,949
Belgium	Jan. 1	4,340,012	3,800,594	3,704,232	3,755,227	3,821,565
Canada	Jan. 1	32,544,816	34,806,671	21,680,489	4,835,497	5,994,144
Denmark	*Jan. 1*	*179,745,595*	*176,081,731*	*175,043,639*	*188,829,579*	*196,061,115*
Finland	Jan. 1	26,891,790	35,135,901	33,192,114	28,024,833	26,525,880
France	Jan. 1	49,842,670	49,781,584	39,307,326	34,648,529	43,951,344
Germany[b]	Jan. 1	1,766,564	1,834,907	953,058	535,062	480,167
Italy	*Jan. 1*	*12,375,425*	*13,359,789*	*10,746,430*	*7,635,006*	*8,602,656*
Netherlands	Jan. 1	52,053,041	51,162,980	56,404,861	64,809,205	72,911,951
New Zealand	Jan. 1	35,208,320	34,240,864	35,865,200	36,785,392	25,756,752
Norway	Jan. 1	3,367,075	3,612,714	3,281,403	2,864,267	3,432,508
Russia	Jan. 1	87,705,713	86,966,484	115,972,393	132,113,551	[c] 112,346,921
Sweden	Jan. 1	43,144,662	40,636,298	35,712,817	38,227,303	40,030,708
United States	Jan. 1	13,880,287	16,194,483	24,468,023	3,857,288	8,918,091
Other countries		2,457,000	3,037,216	3,802,267	3,089,024	[c] 2,865,022
Total		633,017,100	627,990,558	655,113,784	628,435,538	618,935,765

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Australia	Jan. 1	43,873	592,201	70,143	20,885	40,874
Belgium	Jan. 1	9,727,714	10,054,979	11,128,520	12,529,438	10,998,273
Brazil	Jan. 1	5,642,179	6,567,718	5,344,412	5,451,126	4,122,643
British South Africa[d]	*Jan. 1*	*12,980,659*	*12,125,157*	*11,273,748*	*7,533,108*	*7,445,066*
Denmark	Jan. 1	13,007,270	12,566,345	13,049,158	8,429,437	4,376,175
Dutch East Indies	Jan. 1	3,021,377	2,957,073	3,433,031	3,807,470	[c] 3,036,890
Egypt	Jan. 1	3,126,945	3,066,949	2,958,784	3,521,070	2,970,514
France	Jan. 1	10,067,424	10,066,650	11,402,808	14,671,596	12,374,543
Germany[b]	Jan. 1	75,705,838	79,524,904	80,896,179	85,565,569	74,623,809
Netherlands	Jan. 1	5,858,391	5,439,836	5,630,865	3,332,634	2,396,806
Russia	Jan. 1	1,158,390	1,103,318	1,914,484	781,842	[c] 505,579
Sweden	Jan. 1	1,305,925	911,993	1,316,117	1,498,453	275,628
Switzerland	Jan. 1	10,889,289	11,955,445	7,732,271	7,914,152	8,211,776
United Kingdom	Jan. 1	465,285,968	456,662,976	477,092,448	462,175,280	465,443,216
Other countries		11,853,000	17,458,643	17,973,778	21,233,001	[c] 17,538,153
Total		629,674,442	631,054,187	651,216,746	638,465,061	614,359,965

[a] See "General note," p. 442.
[b] Not including free ports prior to March 1, 1906.
[c] Preliminary.
[d] Cape Colony, Natal, and Transvaal before 1906.

Average farm price of butter per pound, monthly, 1908–1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January														
February	25.1		29.4		23.7		24.8		24.1		21.0		31.1	
March	24.5		29.3		23.5		23.9		23.3		20.6		30.4	
April	24.2		29.0		23.5		24.3		22.5		20.0		30.2	
May	24.0		28.3		23.4		24.0		22.6		20.2		27.8	
June	22.5		26.4		22.2		22.0		21.3		19.4		27.5	
July	21.9		25.4		21.4		21.5		20.6		19.0		27.1	
August	22.4		26.8		21.6		22.1		20.8		19.3		27.6	
September	23.8		27.9		22.3		23.1		21.6		19.6		29.4	
October	25.0		30.5		23.7		24.3		23.5		20.7		31.8	
November	26.9		31.5		24.2		26.1		25.0		21.4		32.6	
December	27.4		32.6		25.0		27.1		26.6		22.2		34.8	

SHEEP AND WOOL.

Number and farm value of sheep on farms in the United States, 1867-1910.

Year.	Number.	Price per head Jan. 1.	Farm value Jan. 1.	Year.	Number	Price per head Jan. 1.	Farm value Jan. 1.
1867	39,385,000	$2.50	$98,644,000	1889	42,599,000	$2.13	$90,640,000
1868	38,992,000	1.82	71,053,000	1890	44,336,000	2.27	100,660,000
1869	37,724,000	1.64	62,037,000	1891	43,431,000	2.50	108,397,000
1870	40,853,000	1.96	79,876,000	1892	44,938,000	2.58	116,121,000
1871	31,851,000	2.14	68,310,000	1893	47,274,000	2.66	125,909,000
1872	31,679,000	2.61	82,768,000	1894	45,048,000	1.98	89,186,000
1873	33,002,000	2.71	89,427,000	1895	42,294,000	1.58	66,686,000
1874	33,938,000	2.43	82,353,000	1896	38,299,000	1.70	65,168,000
1875	33,784,000	2.55	86,278,000	1897	36,819,000	1.82	67,021,000
1876	35,935,000	2.37	85,121,000	1898	37,657,000	2.46	92,721,000
1877	35,804,000	2.13	76,362,000	1899	39,114,000	2.75	107,698,000
1878	35,740,000	2.21	78,898,000	1900	41,883,000	2.93	122,666,000
1879	38,124,000	2.07	78,965,000	1901	59,757,000	2.98	178,072,000
1880	40,766,000	2.21	90,231,000	1902	62,039,000	2.65	164,446,000
1881	43,570,000	2.39	104,071,000	1903	63,965,000	2.63	168,316,000
1882	45,016,000	2.37	106,596,000	1904	51,630,000	2.59	133,530,000
1883	49,237,000	2.53	124,366,000	1905	45,170,000	2.82	127,332,000
1884	50,627,000	2.37	119,903,000	1906	50,632,000	3.54	179,056,000
1885	50,360,000	2.14	107,961,000	1907	53,240,000	3.84	204,210,000
1886	48,322,000	1.91	92,444,000	1908	54,631,000	3.88	211,736,000
1887	44,759,000	2.01	89,873,000	1909	56,084,000	3.43	192,632,000
1888	43,545,000	2.05	89,280,000	1910	57,216,000	4.08	233,664,000

Imports, exports, and average prices of sheep, 1892-1909.

Year ending June 30—	Imports.			Exports.		
	Number.	Value.	Average import price.	Number.	Value.	Average export price.
1892	380,814	$1,440,530	$3.78	46,960	$161,105	$3.43
1893	459,484	1,682,977	3.66	37,260	126,394	3.39
1894	242,568	788,181	3.25	132,370	832,763	6.29
1895	291,461	682,618	2.34	405,748	2,630,686	6.48
1896	322,692	853,530	2.65	491,565	3,076,384	6.26
1897	405,633	1,019,668	2.51	244,120	1,531,645	6.27
1898	392,314	1,106,322	2.82	199,690	1,213,886	6.08
1899	345,911	1,200,081	3.47	143,286	853,555	5.96
1900	381,792	1,365,026	3.58	125,772	733,477	5.83
1901	331,488	1,236,277	3.73	297,925	1,933,000	6.49
1902	266,953	956,710	3.58	358,720	1,940,060	5.41
1903	301,623	1,036,934	3.44	176,961	1,067,860	6.03
1904	238,094	815,289	3.42	301,313	1,954,604	6.49
1905	186,942	704,721	3.77	268,365	1,687,321	6.29
1906	240,747	1,020,359	4.24	142,690	804,090	5.64
1907	224,798	1,120,425	4.98	135,344	750,242	5.54
1908	224,765	1,082,606	4.82	101,000	589,285	5.83
1909	102,663	502,640	4.90	67,656	365,155	5.40

SHEEP AND WOOL—Continued.

Number, average price, and farm value of sheep on farms in the United States January 1, 1910

State, Territory, or Division.	Number.	Average price per head Jan. 1.	Farm value Jan. 1.
Maine	254,000	$3.70	$940,000
N. Hampshire	74,000	3.70	273,000
Vermont	229,000	4.00	916,000
Massachusetts	46,000	4.20	193,000
Rhode Island	9,000	4.20	38,000
Connecticut	34,000	4.70	160,000
New York	1,177,000	5.00	5,885,000
New Jersey	44,000	5.20	229,000
Pennsylvania	1,112,000	4.80	5,338,000
N. Atlantic	2,979,000	4.69	13,972,000
Delaware	12,000	4.60	55,000
Maryland	163,000	4.70	766,000
Virginia	522,000	3.90	2,036,000
W. Virginia	709,000	4.30	3,049,000
N. Carolina	215,000	2.60	559,000
S. Carolina	*56,000*	2.40	*134,000*
Georgia	245,000	2.20	539,000
Florida	98,000	2.00	196,000
S. Atlantic	2,020,000	3.63	7,334,000
Ohio	3,203,000	4.80	15,374,000
Indiana	1,227,000	5.20	6,380,000
Illinois	817,000	5.30	4,330,000
Michigan	2,151,000	4.70	10,110,000
Wisconsin	1,034,000	4.50	4,653,000
N. C. E. Miss. River	8,432,000	4.84	40,847,000
Minnesota	482,000	4.00	1,928,000
Iowa	754,000	5.30	3,906,000
Missouri	957,000	4.40	4,211,000
North Dakota	621,000	$4.00	$2,484,000
South Dakota	829,000	4.00	3,316,000
Nebraska	393,000	4.40	1,729,000
Kansas	278,000	4.70	1,307,000
N. C. W. Miss. River	4,314,000	4.40	18,971,000
Kentucky	1,060,000	4.00	4,240,000
Tennessee	347,000	3.40	1,180,000
Alabama	178,000	2.00	356,000
Mississippi	171,000	1.90	325,000
Louisiana	*178,000*	*1.90*	338,000
Texas	1,909,000	2.90	5,536,000
Oklahoma	108,000	3.30	356,000
Arkansas	233,000	2.30	536,000
S. Central	*4,184,000*	*3.08*	*12,867,000*
Montana	5,747,000	4.20	24,137,000
Wyoming	7,316,000	4.40	32,190,000
Colorado	1,729,000	3.80	6,570,000
New Mexico	*4,729,000*	*2.90*	*13,714,000*
Arizona	1,020,000	3.70	3,774,000
Utah	3,177,000	4.10	13,026,000
Nevada	1,585,000	3.70	5,864,000
Idaho	4,248,000	4.70	19,966,000
Washington	783,000	3.90	3,054,000
Oregon	2,581,000	3.70	9,550,000
California	2,372,000	3.30	7,828,000
Far Western	35,287,000	3.96	139,673,000
United States	57,216,000	4.08	233,664,000

SHEEP AND WOOL—Continued.

Wholesale prices of sheep per 100 pounds, 1896–1909.

Date.	Chicago.		Cincinnati.		St. Louis.		Omaha.	
	Inferior to choice.		Good to extra.		Good to choice natives.		Native.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
1896	$1.50	$4.30	$2.25	$4.00	$2.00	$3.75	$1.50	$3.85
1897	2.00	5.00	2.75	5.00	2.00	4.00	1.75	5.25
1898	2.50	5.25	3.10	4.75	3.00	5.00	2.75	5.25
1899	2.50	5.65	3.00	5.00	3.00	5.60	2.75	5.50
1900	2.00	6.50	1.25	6.00	3.40	6.25	2.00	6.10
1901	2.50	5.15	2.10	5.00	3.00	5.10	2.00	5.00
1902	1.25	6.50	2.50	5.75	3.65	6.35	2.00	6.25
1903	1.25	7.00	2.60	6.25	3.50	6.25	3.00	6.75
1904	1.50	6.00	2.75	4.60	3.75	5.65	2.25	5.90
1905	3.80	6.30	3.60	5.50	4.00	6.35	2.50	6.90
1906								
January	3.75	6.25	4.50	5.50	5.75	6.25	4.00	4.60
February	3.50	6.25	4.35	5.50	5.50	6.25	3.50	6.25
March	3.50	6.50	5.00	5.75	5.50	6.45	2.75	6.00
April	3.50	6.50	4.00	5.75	5.50	6.00	3.25	6.15
May	3.75	6.50	4.10	4.75	6.00	6.25	4.50	6.40
June	3.50	6.25	4.40	5.25	6.00	6.10	3.80	6.50
July	3.00	6.25	4.10	4.75	5.25	5.75	4.00	6.25
August	3.00	5.60	4.10	4.75	5.00	5.50	4.50	5.85
September	3.50	5.75	4.10	4.75	5.35	5.75	4.25	5.85
October	3.50	5.75	3.85	4.75	5.35	5.50	4.75	5.65
November	3.25	5.75	4.00	4.60	5.50	5.60	4.50	6.10
December	3.00	7.00	4.00	4.75	5.50	6.00	4.75	6.35
Year	3.00	7.00	3.85	5.75	5.00	6.45	2.75	6.50
1907.								
January	2.25	6.00	4.25	4.65	5.50	6.00	3.50	6.30
February	2.75	6.00	4.50	5.10	5.60	5.85	3.75	6.45
March	3.00	6.50	4.75	5.25	5.65	5.85	3.00	6.50
April	3.50	7.25	5.50	5.90	6.00	6.75	4.00	7.75
May	3.50	7.00	4.75	5.15	6.10	6.50	4.40	6.75
June	3.00	7.00	4.50	4.90	5.85	7.00	4.50	6.75
July	3.25	6.15	4.10	4.65	5.60	5.85	4.00	6.25
August	3.00	6.00	4.55	5.15	5.50	5.75	3.50	6.50
September	3.00	6.00	4.35	4.90	5.50	6.10	3.75	4.65
October	2.00	5.75	4.35	4.90	5.35	5.65	4.00	5.50
November	2.00	5.25	3.85	4.60	5.25	5.35	3.75	5.20
December	2.00	5.25	3.65	4.40	4.25	4.75	3.00	5.00
Year	2.00	7.25	3.65	5.90	4.25	7.00	3.00	7.75
1908.							Western.	
January	2.50	5.75	4.25	5.00	5.00	5.50	3.00	6.10
February	2.50	5.75	4.50	5.25	4.25	6.35	3.50	6.00
March	3.25	7.00	4.65	5.50	5.25	6.50	4.00	7.40
April	3.00	7.00	4.50	5.25	6.50	6.90	3.50	6.70
May	2.00	6.75	4.10	5.00	4.75	5.90	3.00	6.00
June	2.50	5.60	3.60	4.50	5.00	5.50	2.25	6.10
July	2.50	5.25	3.00	3.85	4.40	4.50	2.00	4.50
August	2.25	5.50	3.25	4.00	4.25	4.65	1.25	4.25
September	2.00	5.15	2.75	3.75	4.15	4.35	1.25	4.10
October	2.00	5.25	3.00	3.75	4.10	4.65	1.25	4.75
November	2.00	5.50	3.00	3.75	4.50	4.65	1.25	4.75
December	2.00	5.50	3.25	4.25	4.50	4.75	2.00	5.50
Year	2.00	7.00	2.75	5.50	4.10	6.90	1.25	7.40
1909.								
January	2.50	5.50	3.50	5.25	4.25	6.00	2.00	5.75
February	2.00	5.50	4.50	5.25	5.40	6.25	3.00	5.35
March	3.00	5.75	4.50	5.75	5.50	6.50	3.50	5.50
April	3.50	6.50	4.75	5.75	6.15	6.50	5.25	6.70
May	3.00	6.90	4.35	5.25	6.35	6.65	5.00	6.70
June	2.50	6.75	3.50	5.25	5.25	6.50	4.00	6.50
July	2.50	5.50	3.35	4.50	4.25	5.00	3.50	5.25
August	2.00	5.00	3.75	4.50	4.50	5.00	3.65	4.85
September	2.00	5.25	3.50	4.50	4.50	5.00	3.65	4.90
October	2.00	5.00	3.35	4.25	4.75	5.00	3.70	4.75
November	2.00	5.50	3.60	4.50	4.35	5.00	3.75	5.35
December	2.50	6.00	3.75	5.50	5.15	6.25	3.90	6.00
Year	2.00	6.90	3.35	5.75	4.25	6.65	2.00	6.70

SHEEP AND WOOL—Continued.

Wool product of the United States in 1909, by States.

[Estimate of National Association of Wool Manufacturers.]

State or Territory.	Number of sheep of shearing age Apr. 1, 1909.	Average weight of fleece, 1909.	Per cent of shrinkage, 1909.	Wool, washed and unwashed.	Wool, scoured.
		Pounds		*Pounds*	*Pounds*
Maine	210,000	[illegible]	40	1,260,000	756,000
New Hampshire	70,000	6.2	50	434,000	217,000
Vermont	180,000	6.5	51	1,170,000	573,300
Massachusetts	35,000	6	42	210,000	121,800
Rhode Island	7,500	5.3	42	39,750	23,055
Connecticut	38,000	5	42	190,000	110,200
New York	825,000	6	49	4,950,000	2,524,500
New Jersey	44,000	5.5	47	242,000	128,260
Pennsylvania	1,000,000	6	48	6,000,000	3,120,000
Delaware	6,900	5.75	45	39,675	21,821
Maryland	125,000	5	47	625,000	331,250
Virginia	365,000	4.5	38	1,642,500	1,018,350
West Virginia	587,945	5.75	49	3,380,684	1,724,149
North Carolina	204,000	4	42	816,000	473,280
South Carolina	50,000	4	42	200,000	116,000
Georgia	225,000	3.25	40	731,250	438,750
Florida	110,000	3.25	40	357,500	214,500
Ohio	2,500,000	6.6	52	16,500,000	7,920,000
Indiana	850,000	6.5	45	5,525,000	3,038,750
Illinois	700,000	6.75	51	4,725,000	2,315,250
Michigan	1,500,000	6.75	51	10,125,000	4,961,250
Wisconsin	850,000	6.5	48	5,525,000	2,873,000
Minnesota	375,000	6.75	49	2,531,250	1,290,938
Iowa	700,000	6.75	49	4,725,000	2,409,750
Missouri	873,800	6.5	48	5,680,000	2,953,647
North Dakota	275,000	6.5	60	1,787,500	715,000
South Dakota	650,000	6.5	60	4,225,000	1,690,000
Nebraska	275,000	6.5	62	1,787,500	677,250
Kansas	170,000	7	64	1,100,000	421,400
Kentucky	750,000	5	39	3,750,000	2,287,500
Tennessee	291,000	4.3	40	1,251,300	750,780
Alabama	170,000	3.25	40	552,500	331,500
Mississippi	150,000	4	42	600,000	348,000
Louisiana	155,000	3.7	42	573,500	332,630
Texas	1,325,000	6.75	67	8,943,750	3,040,875
Oklahoma	80,000	6.5	68	520,000	166,400
Arkansas	220,000	4.25	41	935,000	551,650
Montana	5,000,000	7	63	35,000,000	13,300,000
Wyoming	4,800,000	8	67	38,400,000	12,288,000
Colorado	1,450,000	6.8	65	9,860,000	3,451,000
New Mexico	825,000	6.3	65	5,197,500	1,819,125
Arizona	3,200,000	6	65	19,200,000	6,720,000
Utah	2,200,000	6.75	66	14,850,000	5,049,000
Nevada	875,000	7.5	69	6,562,500	2,034,375
Idaho	2,800,000	7.5	66	21,000,000	7,140,000
Washington	450,000	9.5	69	4,275,000	1,325,250
Oregon	1,850,000	8.5	68	15,725,000	4,874,750
California	1,900,000	7	66	13,300,000	4,522,000
United States	42,293,205	6.8	60.9	287,110,749	113,523,785
Pulled wool			30	41,000,000	28,700,000
Total product 1909				328,110,749	142,223,785

SHEEP AND WOOL—Continued.

Wholesale prices of wool per pound, 1896-1909.

Date.	Boston.		Philadelphia.		St. Louis.	
	XX Ohio, washed.		XX Ohio, washed.		Best tub-washed.	
	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1896	17	21	16	21	17	21
1897	19	30	19	31	20½	32
1898	27	30	28	31	25½	30
1899	25½	38	25½	36	25½	35
1900	27	38	27	37	28	36
1901	26	28	25	28	24	29½
1902	27	32	26	32	24	29
1903	30	35	30	34	27	31
1904	32	36	31½	33½	30½	41
1905	34	37	34	36	37	43
1906.						
January	34	36	34	35	33	35
February	34	34½	34	35	31	35
March	34	34½	34	35	36	38
April	34	34½	34	35	36	38
May	34	34½	34	35	38	40
June	34	34½	34	34½	38	39
July	34	35	33½	34	38	38½
August	34	35	33½	34	37	38½
September	34	34½	33½	34	37	38
October	33½	34½	33½	34	37	38
November	33½	34	33	34	37	37½
December	34	34½	33	34	38	38
Year	33½	36	33	35	31	40
1907.						
January	34	34½	33½	34	38	38
February	34	34½	33½	34	38	38
March	34	34½	33½	34	37	38
April	34	34½	33½	34	36	38
May	33	34½	33½	34	36	37
June	33	34	33	34	36	37½
July	33	34	33	34	36	36½
August	34	35	33	34	36	36½
September	34	35	33	34	35	36
October	34	35	33	34	36	36
November	34	35	33	34	33	35
December	34	35	33	34	33	33
Year	33	35	33	34	33	38
1908.						
January	34	35	33	34	33	33
February	33	34	33	33½	33	33
March	33	34	32½	33	30	33
April	32	34	32	32½	24	30
May	30	32	31	32	22	25
June	30	32	30	31	25	27½
July	32	33	31	32	27	27
August	32	33	32	33	27	27
September	32	33	32	33	26	27
October	32	33	32	33	26	27
November	32½	33	32	33	26	29
December	32½	35	33	33½	28	30
Year	30	35	30	34	22	33
1909.						
January	34	35	32	33	30	31
February	34	35	32	33	31	32
March	34	35	32	34	31	32
April	34	35	33	34	31	32
May	34	35	34	35	32	38
June	35	36	34	35	36	38
July	35	36	34	35	36	36½
August	35	36	34	35	36	37½
September	35	37	34	35	37	37½
October	36	37	34	35	37	38
November	37	38	34	35	38	38
December	37	38	34	35	37	38
Year	34	38	32	35	30	38

SHEEP AND WOOL—Continued.

Range of prices of wool per pound in Boston, 1896–1909.[a]

Date.	Ohio fine, unwashed.		Indiana quarter-blood, unwashed.		Ohio XX, washed.		Ohio No. 1, washed.		Ohio Delaine, washed.		Michigan fine, unwashed.[b]		Fine selected Territory, staple scoured.		Fine medium Territory, clothing scoured.		Texas, 12 months, scoured.		Fine free fall, Texas or California, scoured		Pulled, A super, scoured.		Pulled, B super, scoured.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1896	12	15	14	18½	17	21	17	22	18	22	14	17½	28	38	25	35	28	36	23	30	28	33	23	29
1897	13½	21	16½	24	19	30	21	30	20	30	16½	24	36	58	30	52	33	55	26	45	31	48	28	43
1898	18	21	20	24	27	30	29	31	28	32	21	25	46	57	42	52	42	53	35	45	40	48	32	43
1899	16	26	20	28	25½	38	28½	30	27	40	20	30	42	75	38	62	40	65	30	52	40	57	30	52
1900	18	26	23	29	27	38	28	39	27½	40	21½	29	49	74	45	62	48	65	40	55	42	57	37	50
1901	16½	19½	19½	24	26	28	25	29	27½	30	20	22	43	50	35	44	43	50	36	42	35	45	30	38
1902	19	23	20½	24	27	32	26	31	28	35	21	27	48	59	42	50	45	60	38	48	38	46	33	40
1903	20	25	22	25	30	35	29	34	33½	37	21	27½	52	60	50	58	53	60	44	48	40	47	39	44
1904	21	25	24	33	32	36	30	40	34	38	19	22	50	70	50	68	52	68	44	56	43	60	40	55
1905	23	30	30	37	34	37	36	43	36	40	20	27	65	78	60	72	63	76	54	63	55	65	52	60
1906.																								
January	26	28	33	34	34	36	39	40	36½	37	25	26½	75	78	65	68	74	76	62	63	62	63	53	56
February	26	26½	32	34	34	34½	39	40	36½	37	26	26½	75	76	66	68	74	76	62	63	60	63	52	55
March	24	26	32	32½	34	34½	39	40	36½	37	24	25	72	73	66	68	72	73	62	63	60	62	52	55
April	24	25	32	32½	34	34½	39	40	36½	37	24	25	72	73	66	68	72	73	62	63	60	62	52	55
May	24	26	32	32½	34	34½	37	40	36½	37	24	25	72	73	66	68	72	73	62	63	60	64	52	55
June	24	25	32	32½	34	34½	37	38	36½	37	24	25	72	73	66	70	72	73	62	63	60	64	52	55
July	24	25	32	34	34	35	37	38	36½	37	24	25	72	75	68	70	72	73	62	63	60	64	52	55
August	24	26	33	34	34	35	40	41	36	37	24	26	73	75	68	70	72	73	62	63	60	64	51	55
September	25	26	33	34	34	34½	40	41	36	37	25	26	73	75	68	70	72	73	58	63	60	64	50	55
October	24	26	30	34	33½	34½	40	41	35½	37	24	26	70	75	65	69	72	73	58	60	57	64	49	55
November	24	25	30	31½	33½	34	40	41	35½	36½	24	25	70	72	65	67	72	73	58	60	56	60	47	53
December	24	25	31	32	34	34½	40	41	36½	37½	24	25	70	73	66	68	72	73	58	62	53	59	47	53
Year	24	28	30	34	33½	36	37	41	35½	37½	24	26½	70	78	65	70	72	76	58	63	53	64	47	56
1907.																								
January	25	27	32	34	34	34½	40	41	37	38	24	25	72	75	66	70	72	75	60	62	56	58	46	52
February	26	27	32	34	34	34½	40	41	37	38	25	25	72	75	68	70	73	75	60	62	56	60	47	52
March	26	27	31	33	34	34½	39	40	37	38	25	25	72	73	68	73	72	75	58	60	53	60	45	52
April	26	27	31	33	34	34½	39	40	37	38	24	25	72	73	68	70	72	74	58	60	53	58	45	50
May	25	27	30	33	33	34½	38	40	36	38	24	25	70	73	68	70	72	74	57	60	53	58	45	50
June	25	26	30	31	33	34	38	39	36	37½	23	24	70	73	68	70	70	73	57	58	53	58	43	47
July	25	28	30	31	33	34	38	39	37	38	24	25	72	73	68	70	72	73	57	58	53	58	44	47

[a] From Commercial Bulletin, Boston.

[b] Quoted as X, washed, to June, 1903.

SHEEP AND WOOL—Continued.

Range of prices of wool per pound in Boston, 1896-1909—Continued.

Date.	Ohio fine, unwashed.		Indiana quarter-blood, unwashed.		Ohio XX, washed.		Ohio No. 1, washed.		Ohio Delaine, washed.		Michigan fine, unwashed.		Fine selected Territory, staple scoured.		Fine medium Territory, clothing scoured.		Texas, 12 months, scoured.		Fine free full, Texas or California, scoured.		Pulled, A super, scoured.		Pulled, B super, scoured.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low.	High.	Low	High.	Low.	High.	Low.	High.	Low.	High.
1907.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
August	26	27	29	31	34	35	39	40	38	39	24	26	72	75	68	72	72	73	57	58	55	58	43	47
September	27	27	29	31	34	35	39	40	38	39	25	26	72	73	70	72	72	73	57	58	52	58	43	45
October	27	27	29	30	34	35	39	40	38	39	24	26	72	73	70	72	72	73	57	58	52	57	43	45
November	26	27	29	30	34	35	39	40	38	39	24	25	72	73	70	72	72	73	52	58	50	57	42	45
December	26	27	29	30	34	35	39	40	38	39	24	25	70	73	68	72	72	73	50	55	45	55	38	45
Year	25	28	29	34	33	35	38	41	36	39	23	26	70	75	66	73	70	75	50	62	45	60	38	52
1908.																								
January	26	27	28	30	34	35	38	40	38	39	24	25	70	72	58	62	70	72	50	53	46	55	38	45
February	24	27	26	30	33	34	37	39	37	38	22	25	65	70	53	57	68	70	48	52	45	48	35	40
March	24	26	25	28	33	34	37	38	37	38	22	24	63	68	53	55	63	65	48	50	44	48	35	40
April	22	25	23	26	32	34	35	38	35	37	21	23	58	65	48	55	56	65	43	48	44	48	35	40
May	19	21	20	24	30	32	31	35	31	34	18	20	54	60	43	48	50	56	42	45	44	48	32	38
June	19	20	20	24	30	32	31	32	31	34	18	20	53	57	43	48	50	52	42	43	44	45	32	37
July	21	23	23	25	32	33	32	35	33	36	20	22	55	60	45	48	50	55	42	43	44	46	32	38
August	20	23	24	25	32	33	34	35	35	36	20	22	57	60	45	48	52	53	42	43	43	45	35	38
September	20	22	23	24	32	33	34	35	34	36	19	21	57	58	43	45	50	53	42	43	42	45	35	38
October	21	22	23	25	32	33	34	35	34	35	20	21	57	60	45	50	50	54	42	43	42	48	35	40
November	21	22	24	27	32½	33	34	35	34	36	20	21	57	63	47	52	51	60	42	50	43	50	36	45
December	21	24	25	27	32½	35	34	39	35	37	20	22	62	65	49	52	60	62	45	47	47	55	39	45
Year	19	27	20	30	30	35	31	40	31	39	18	25	53	72	43	62	50	72	42	53	42	55	32	45
1909.																								
January	23	24	27	28	34	35	38	39	37	40	22	23	62	65	60	62	66	65	48	50	47	53	38	48
February	23	24	27	29	34	35	38	39	38	40	22	23	62	65	60	62	62	65	48	50	50	55	40	48
March	23	24	27	29	34	35	38	39	38	40	22	23	63	65	60	62	62	65	48	50	50	55	40	48
April	23	24	27	29	34	35	38	39	39	40	22	23	63	65	60	62	62	65	45	47	50	56	40	48
May	23	28	28	37	34	35	38	40	39	42	23	25	63	77	60	72	62	67	45	55	55	60	46	53
June	27	28	36	37	35	36	40	41	40	42	25	26	74	78	69	72	70	72	58	60	55	62	48	53
July	27	28	32	37	35	36	40	41	40	42	25	26	74	78	69	72	70	75	58	60	55	62	48	53
August	27	28	32	33	35	36	40	41	39	40	25	26	75	80	69	72	73	78	58	60	55	62	48	55
September	27	28	32	33	35	37	40	41	39	41	25	26	77	80	70	72	75	78	58	60	55	63	50	68
October	27	28	32	33	36	37	40	41	40	41	25	26	77	80	70	72	75	78	58	60	60	64	52	58
November	27	28	32	33	37	38	40	41	39	41	25	26	77	80	70	72	75	78	58	60	60	64	52	58
December	27	28	32	33	37	38	40	41	39	40	25	26	77	80	70	72	73	78	58	62	60	65	52	58
	23	28	27	37	34	38	38	41	37	42	22	26	62	80	60	72	60	78	45	62	47	65	38	58

SHEEP AND WOOL—Continued.

International trade in wool, 1904–1908. [a]

EXPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Algeria	Jan. 1	21,518,315	22,501,034	35,486,857	26,624,118	[b] 26,624,118
Argentina	Jan. 1	371,697,065	421,098,234	328,731,186	341,297,532	6,904,937
Australia	Jan. 1	395,130,825	437,167,965	523,026,207	637,836,589	508,032,190
Belgium	Jan. 1	42,081,470	40,023,199	40,098,225	40,778,437	40,365,085
British India	Jan. 1	37,863,072	39,212,655	44,870,964	44,194,774	32,108,670
British South Africa [c]	Jan. 1	78,411,050	74,311,616	104,516,205	116,472,023	122,413,992
Chile	Jan. 1	6,993,060	20,753,848	28,978,611	31,762,088	[d] 6,928,157
China	Jan. 1	38,042,933	46,404,400	46,205,733	39,429,333	33,441,462
France	Jan. 1	74,093,959	72,227,925	79,511,478	84,649,488	72,331,175
Netherlands	Jan. 1	33,032,572	30,778,915	28,009,001	20,290,406	26,759,443
New Zealand	Jan. 1	126,834,850	145,257,159	159,849,207	177,335,594	168,035,607
Peru	Jan. 1	7,351,060	9,944,967	10,006,289	8,406,261	[b] 8,406,261
Russia	Jan. 1	35,298,276	32,423,264	41,919,341	30,351,612	[d] 11,939,541
Spain	Jan. 1	28,808,285	43,825,032	26,552,450	32,203,800	11,371,068
Turkey	Mar. 14	[e] 40,621,737	40,156,583	[f] 40,156,583	[f] 40,156,583	[f] 40,156,583
United Kingdom	Jan. 1	37,858,500	35,251,500	29,808,700	31,148,692	38,311,000
Uruguay	Jan. 1	93,148,322	72,917,218	90,743,833	99,840,335	[d] 84,129,000
Other countries		148,748,000	156,086,187	105,659,951	85,230,391	[d] 77,480,629
Total		1,624,131,351	1,740,340,802	1,762,260,971	1,888,204,121	1,790,567,023

IMPORTS.

Country.	Year beginning—	1904.	1905.	1906.	1907.	1908.
Austria-Hungary	Jan. 1	62,501,474	59,692,125	81,968,287	52,919,967	60,628,869
Belgium	Jan. 1	117,205,945	140,786,550	134,875,551	148,253,340	131,118,370
British India	Jan. 1	13,841,838	16,757,543	22,387,912	20,626,006	18,470,491
Canada	Jan. 1	7,578,384	6,807,270	5,164,318	6,106,325	4,465,680
France	Jan. 1	466,088,531	480,776,007	535,280,408	554,982,155	504,910,496
Germany [g]	Jan. 1	413,781,976	446,726,394	438,284,806	439,917,329	430,576,568
Japan	Jan. 1	21,281,995	14,085,106	13,413,686	18,916,310	5,551,456
Netherlands	Jan. 1	42,618,842	37,692,892	34,783,842	24,081,928	31,714,118
Russia	Jan. 1	50,207,084	60,795,682	69,585,429	78,494,890	[d] 52,760,801
Sweden	Jan. 1	10,471,454	10,114,559	10,807,835	11,622,335	7,108,456
Switzerland	Jan. 1	11,528,600	10,951,062	11,464,696	10,323,804	11,097,626
United Kingdom	Jan. 1	344,758,631	369,465,005	406,403,772	527,706,993	470,804,920
United States	Jan. 1	186,572,683	246,821,389	196,844,298	188,305,955	142,559,384
Other countries		59,941,000	49,382,190	44,973,075	44,401,449	[d] 49,487,750
Total		1,808,378,437	1,950,943,624	2,009,238,115	2,127,018,786	1,921,317,983

[a] See "General note," p. 442.
[b] Year preceding.
[c] Cape Colony before 1906.
[d] Preliminary.
[e] Figures for 1899.
[f] Figures for 1905.
[g] Not including free ports prior to March 1, 1906.

SWINE.

Number and farm value of swine on farms in the United States, 1867–1910.

January 1—	Number.	Price per head.	Farm value.
1867	24,694,000	$4.03	$99,637,000
1868	24,317,000	3.29	79,976,000
1869	23,316,000	4.65	08,431,000
1870	26,751,000	5.80	155,108,000
1871	29,458,000	5.61	165,312,000
1872	1,796,000	4.01	127,453,000
1873	32,632,000	3.67	119,632,000
1874	30,861,000	3.98	122,695,000
1875	28,062,000	4.80	134,581,000
1876	25,727,000	6.00	154,251,000
1877	28,077,000	5.66	158,873,000
1878	32,262,000	4.85	156,577,000
1879	34,766,000	3.18	110,508,000
1880	34,034,000	4.28	145,782,000
1881	36,248,000	4.70	170,535,000
1882	44,122,000	5.97	263,543,000
1883	43,270,000	6.75	291,951,000
1884	44,201,000	5.57	246,301,000
1885	45,143,000	5.02	226,402,000
1886	46,092,000	4.26	196,570,000
1887	44,613,000	4.48	200,043,000
1888	44,347,000	4.98	220,811,000
1889	50,302,000	$5.79	$291,307,000
1890	51,603,000	4.72	243,418,000
1891	50,625,000	4.15	210,194,000
1892	52,398,000	4.60	241,031,000
1893	46,095,000	6.41	295,426,000
1894	45,206,000	5.98	270,385,000
1895	44,166,000	4.97	219,501,000
1896	42,843,000	4.35	186,530,000
1897	40,600,000	4.10	166,273,000
1898	39,760,000	4.39	174,351,000
1899	38,652,000	4.40	170,110,000
1900	37,079,000	5.00	185,472,000
1901	56,982,000	6.20	353,012,000
1902	48,699,000	7.03	342,121,000
1903	46,923,000	7.78	364,974,000
1904	47,009,000	6.15	289,025,000
1905	47,321,000	5.99	283,255,000
1906	52,103,000	6.18	321,803,000
1907	54,794,000	7.62	417,791,000
1908	56,084,000	6.05	339,030,000
1909	54,147,000	6.55	354,794,000
1910	47,782,000	9.14	436,603,000

Number, average price, and farm value of swine on farms in the United States, January 1, 1910.

State, Territory, or Division.	Number.	Average price per head Jan. 1.	Farm value Jan. 1.
Maine	62,000	$11.50	$713,000
New Hampshire	51,000	11.50	586,000
Vermont	95,000	10.00	950,000
Massachusetts	68,000	11.50	782,000
Rhode Island	13,000	12.50	162,000
Connecticut	47,000	12.50	588,000
New York	656,000	11.50	7,544,000
New Jersey	152,000	12.00	1,824,000
Pennsylvania	931,000	9.50	8,844,000
N. Atlantic	2,075,000	10.60	21,993,000
Delaware	46,000	8.70	400,000
Maryland	273,000	8.90	2,430,000
Virginia	774,000	6.50	5,031,000
West Virginia	338,000	7.70	2,603,000
North Carolina	1,356,000	7.20	9,763,000
South Carolina	699,000	7.20	5,033,000
Georgia	1,647,000	7.00	11,529,000
Florida	456,000	4.80	2,189,000
S. Atlantic	5,589,000	6.97	38,978,000
Ohio	2,047,000	10.70	21,903,000
Indiana	2,578,000	10.00	25,780,000
Illinois	3,772,000	10.90	41,115,000
Michigan	1,159,000	10.50	12,170,000
Wisconsin	1,651,000	11.80	19,482,000
N. C. E. Miss. R.	11,207,000	10.75	120,450,000
Minnesota	1,003,000	11.50	11,534,000
Iowa	6,485,000	11.30	73,280,000
Missouri	2,714,000	7.90	21,441,000
North Dakota	206,000	$11.00	$2,266,000
South Dakota	805,000	11.10	8,936,000
Nebraska	3,201,000	11.00	35,211,000
Kansas	1,942,000	10.00	19,420,000
N. C. W. Miss. R.	16,356,000	10.52	172,088,000
Kentucky	989,000	6.80	6,725,000
Tennessee	1,264,000	6.50	8,216,000
Alabama	1,176,000	6.00	7,056,000
Mississippi	1,290,000	5.50	7,095,000
Louisiana	744,000	5.50	4,092,000
Texas	3,205,000	6.60	21,153,000
Oklahoma	1,302,000	7.70	10,025,000
Arkansas	978,000	4.80	4,694,000
S. Central	10,948,000	6.31	69,056,000
Montana	75,000	10.10	758,000
Wyoming	21,000	8.50	178,000
Colorado	248,000	9.50	2,356,000
New Mexico	32,000	8.50	272,000
Arizona	22,000	9.50	209,000
Utah	61,000	9.00	549,000
Nevada	15,000	9.00	135,000
Idaho	143,000	8.70	1,244,000
Washington	183,000	9.40	1,720,000
Oregon	267,000	8.20	2,189,000
California	540,000	8.20	4,428,000
Far Western	1,607,000	8.74	14,038,000
United States	47,782,000	9.14	436,603,000

SWINE—Continued.

Wholesale prices of live hogs per 100 pounds, 1896–1909.

Date	Cincinnati: Packing, fair to good.		St. Louis: Mixed packers.		Chicago.		Omaha.	
	Low	High	Low	High	Low	High	Low	High
1896	$3.15	$5.45	$2.85	$4.25	$2.45	$4.45	$2.90	$4.12½
1897	3.00	4.45	3.10	4.50	3.00	4.65	2.85	4.17½
1898	3.15	4.45	3.10	4.55	3.10	4.80	3.10	4.60
1899	3.45	4.85	3.40	4.85	3.30	5.00	3.25	4.70
1900	4.45	5.85	4.40	5.75	3.35	5.85	4.15	5.62½
1901	5.15	7.20	4.90	7.10	3.00	7.40	4.45	6.85
1902	5.85	8.00	5.80	8.20	4.40	8.20	5.25	8.05
1903	4.15	7.75	4.20	7.60	3.75	7.85	4.10	7.55
1904	4.35	6.25	4.25	6.30	3.60	6.37½	4.20	6.05
1905	4.60	6.35	4.75	6.35	3.90	6.45	4.30	6.10
1906								
January	5.40	5.80	5.10	5.45	4.60	5.70	4.85	5.50
February	5.65	5.45	5.35	6.20	5.10	6.40	5.25	6.20
March	6.30	6.75	6.10	6.45	5.50	6.55	5.85	6.37½
April	6.35	6.75	6.25	6.65	5.15	6.82½	6.10	6.55
May	6.25	6.62	6.22	6.57	5.10	6.67½	6.10	6.45
June	6.30	6.85	6.20	6.75	5.25	6.85	6.10	6.60
July	6.65	6.95	6.55	6.97	5.60	7.00	6.15	6.75
August	6.00	6.72	6.05	6.67	5.10	6.80	5.45	6.45
September	6.10	6.80	6.12	6.67	5.25	6.80	5.40	6.45
October	6.10	6.80	6.15	6.70	5.16	6.85	5.92½	6.50
November	6.10	6.50	6.07	6.42	5.20	6.50	5.80	6.27½
December	6.10	6.55	5.95	6.45	5.30	6.55	5.90	6.35
Year	5.30	6.95	5.10	6.97	4.60	7.00	4.85	6.75
1907.								
January	6.40	7.00	6.20	6.87	5.50	6.97½	6.15	6.90
February	6.80	7.40	6.65	7.22	6.00	7.25	6.67½	7.05
March	6.25	7.25	6.07	7.15	5.50	7.05	6.00	6.90
April	6.50	6.90	6.50	6.85	5.90	6.90	6.20	6.55
May	6.25	6.72	6.25	6.65	5.70	6.65	5.77½	6.50
June	5.75	6.30	5.87	6.47	5.40	6.42½	5.70	6.20
July	5.75	6.55	5.85	6.45	5.20	6.65	5.50	6.30
August	6.10	6.85	5.85	6.80	5.20	6.70	5.35	6.25
September	6.25	6.90	6.00	6.75	4.75	7.00	5.40	6.35
October	5.90	7.10	6.30	7.00	4.00	7.05	5.25	6.50
November	4.15	6.25	4.00	6.45	3.10	6.33½	3.80	5.75
December	4.25	5.35	4.25	5.30	3.50	5.25	4.10	4.85
Year	4.15	7.40	4.00	7.22	3.10	7.25	3.80	7.05
1908.								
January	4.15	4.70	4.20	4.62	3.95	4.72½	4.06	4.40
February	4.25	4.85	4.20	4.60	4.00	4.70	3.97	4.29
March	4.55	6.30	4.40	6.12	4.15	6.35	4.20	5.78
April	5.50	6.40	3.50	6.15	5.00	6.45	5.26	5.82
May	5.35	5.95	5.30	5.85	5.00	5.90	5.14	5.78
June	5.30	6.60	5.30	5.90	5.05	6.67½	5.23	6.03
July	5.35	7.10	5.90	6.90	5.60	7.10	5.95	6.44
August	6.10	7.15	6.25	6.90	5.60	7.10	6.17	6.53
September	6.00	7.35	6.40	7.35	6.05	7.60	6.43	6.90
October	4.85	7.00	5.10	7.15	4.70	7.20	5.21	6.03
November	5.10	6.20	5.40	6.05	4.65	6.40	5.54	5.80
December	5.25	6.25	5.30	5.90	4.60	6.15	5.30	5.79
Year	4.15	7.35	4.20	7.35	3.95	(a) 7.60	3.97	6.90
1909.								
January	5.75	6.75	5.75	6.60	5.20	6.70	5.25	6.35
February	6.15	7.10	6.05	6.75	5.75	6.95	5.50	6.60
March	6.30	7.30	6.10	7.05	5.95	7.15	5.65	6.95
April	6.80	7.55	6.75	7.45	6.50	7.60	6.40	7.30
May	7.05	7.55	6.95	7.40	6.75	7.55	6.60	7.45
June	7.05	8.15	7.10	8.00	6.80	8.20	6.90	7.90
July	7.40	8.40	7.60	8.20	7.00	8.45	7.20	8.05
August	7.75	8.30	7.60	8.10	6.95	8.25	7.20	7.95
September	7.60	8.45	7.70	8.40	7.20	8.60	7.45	8.30
October	7.25	8.15	7.25	8.05	6.85	8.40	7.00	8.00
November	7.55	8.25	7.70	8.40	7.20	8.45	7.55	8.15
December	7.95	8.80	7.80	8.65	7.65	8.75	7.30	8.50
Year	5.75	8.80	5.75	8.65	5.20	8.75	5.25	8.50

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POULTRY.

Average farm price of chickens (live) per pound, monthly, 1908–9.

Month.	United States.		North Atlantic States.		South Atlantic States.		N. Cen. States East of Miss. R.		N. Cen. States West of Miss. R.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January														
February	9.9		12.5		10.8		9.7		[illegible]		9.2		[illegible]	
March	10.0		12.2		11.4		10.2		8.9		8.9		12.5	
April	10.2		13.0		11.1		10.4		8.9		9.2		12.6	
May	10.6		13.2		11.9		[illegible]		9.6		9.3		13.1	
June	10.9		13.5		12.3		10.9		9.6		10.4		[illegible]	
July	11.1		14.1		12.6		11.1		9.8		10.2		13.2	
August	11.2		14.2		12.6		11.0		10.0		10.4		13.7	
September	11.1		13.8		[illegible]		11.1		[illegible]		9.8		[illegible]	
October	11.3		14.1		13.0		11.2		9.8		10.3		13.5	
November	10.9		14.0		13.4		10.7		9.5		10.1		13.8	
December	10.8		12.2		12.5		10.4		9.4		10.3		13.8	

EGGS.

Wholesale price of eggs per dozen, 1896–1909.

Date.	New York. Average best fresh.		Cincinnati.		Chicago. Fresh.		St. Louis. Average best fresh.	
	Low.	High.	Low.	High.	Low.	High.	Low.	High.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1896	10½	25	7	17	7½	22	6	19
1897	9¼	25	7	17	8	22	6	18
1898	10	27	8	20	8½	26	8	20
1899	12½	35	8½	24	10	35	9	22
1900	12	29	9	22	10	26	8	23
1901	13	31	9	27	10	28	6	25
1902	15½	37	13	32	13¾	33½	11¼	32
1903	15	45	12	28	10	30	11	28½
1904	16	47	14½	32	11	34½	13	29
1905	16½	40	14	30	12	36	10½	34
1906.								
January	17½	34	16	24	16	27	14	22
February	15½	27	13	17	11	21½	11½	17
March	14½	22	13	13½	12	17	12	15
April	17	22	14	16½	14	19½	13½	16
May	16	21	14	14½	12	18½	13	14
June	17	23	14	14½	12	19	15	17
July	17	25	14	15½	12	18½	12½	13
August	18	28	14½	18	12	20½	13	15
September	21	33	19	21	12	24½	15	17½
October	20	35	22	24	15	27	18	22
November	20	42	28	29	20	32	20	26
December	22	45	25	29	20	36	21	26
Year	14½	45	13	29	11	36	11½	26
1907.								
January	25	36	22	25	23	28	21	22½
February	25	32	20	24	24	30	16½	25½
March	17	30	15	16	16	22	14	17
April	16½	21	14½	15	15	17½	13½	16
May	16½	21	13½	15	14½	17	13	14
June	16	20	13½	......	13	15	12	13
July	16	26	14½	15	13	16	12	13
August	18	30	15	20	16	20	12	16
September	20	32	20	21	18½	21½	16	17½
October	23	45	21	23	21	24	17½	18½
November	26	50	25	28	22	26	19	21
December	25	50	26	29	22	27	20	23
Year	16	50	13½	29	13	30	12	25½

EGGS—Continued

Wholesale price of eggs per dozen, 1896–1909—Continued.

Date.	New York, Average best fresh		Cincinnati		Chicago, Fresh		St. Louis, Average best fresh	
	Low	High	Low	High	Low	High	Low	High
1908.	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
January	23	38	19	26	21	30	18	21
February	20	32	18	23	19	27	17	23
March	15	29	13	18	14	22½	13	17
April	15½	20	13	14	14½	16½	13	15
May	16½	21	15½	15½	14½	17	14	14
June	15	24	15½	17	14	17½	12½	14
July	17	26	14	17	15½	19½	13½	14½
August	18	30	14	[illegible]	17½	20½	14½	16
September	19	35	19	24	19	23	16	18½
October	22	44	22	28	22	27	18½	23
November	24	50	23	34	26	30	25	27
December	28	55	25	30	28	33	25	29
Year	15	55	13	30	14	33	12½	29
1909.			(a)					
January	29	40	28	36	21	36	26	38
February	24	40	21	37	20	35	21	40
March	19	25	17	20	17½	20½	16	18½
April	20½	25	20	22	18½	20½	18	20
May	22	26½	20	22	19	25	18	20
June	21½	29	19½	21½	17½	21½	17½	19
July	23	32	20½	22½	18	22½	17	19½
August	24	34	20	23	19	23	17	19
September	25	37	23	24	19	24	18	21
October	25	50	23	28½	20	27	21	23½
November	25	55	29	31½	23	30½	23½	27
December	30	53	28	35	26½	36½	25½	31
Year	19	55	17	37	17½	36½	16	40

a Prime firsts.

Average farm price of eggs per dozen, monthly, 1909.

Month.	United States.		North Atlantic States.		South Atlantic States.		North Central States East of Mississippi River.		North Central States West of Mississippi River.		South Central States.		Far Western States.	
	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
January														
February	25.8	......	30.3	......	22.6	......	27.0	......	25.3	......	20.5	......	34.3	......
March	20.1	......	25.5	......	18.5	......	20.5	......	18.5	......	16.5	......	24.0	......
April	16.8	......	20.0	......	16.5	......	17.1	......	15.9	......	14.2	......	21.8	......
May	17.8	......	20.4	......	16.8	......	18.5	......	17.2	......	14.8	......	21.8	......
June	18.4	......	21.8	......	17.6	......	19.3	......	17.4	......	15.0	......	22.7	......
July	18.5	......	23.5	......	17.4	......	18.9	......	16.9	......	15.2	......	24.1	......
August	19.2	......	25.7	......	18.1	......	20.0	......	17.0	......	15.1	......	25.8	......
September	20.2	......	27.6	......	19.7	......	20.7	......	17.3	......	15.9	......	28.7	......
October	22.1	......	29.7	......	22.6	......	21.8	......	19.0	......	18.4	......	31.6	......
November	24.8	......	33.1	......	24.6	......	24.3	......	21.7	......	21.2	......	35.4	......
December	28.4	......	38.0	......	27.3	......	28.2	......	25.1	......	23.5	......	40.5	......

TRANSPORTATION.

Tonnage of farm products carried on railways in the United States, 1904–1908.[a]

[Compiled from reports of the Interstate Commerce Commission. Tons of 2,000 pounds.]

Class of products.	Year ending June 30—				
	1904.	1905.	1906.	1907.	1908.
Animal matter:	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Animals, live	10,190,124	10,611,555	11,089,456	11,727,889	11,541,195
Packing-house products—					
Dressed meats	1,730,576	1,617,395	1,813,485	1,952,538	2,081,155
Hides (including leather)	911,778	982,267	1,028,148	1,082,585	937,872
Other packing-house products	2,365,505	2,502,016	2,480,537	2,312,313	2,054,744
Total packing-house products	5,007,859	5,101,678	5,322,170	5,347,436	5,073,771
Poultry (including game and fish)	680,829	750,390	867,811	838,905	717,201
Wool	374,854	387,034	353,436	329,786	317,391
Other animal matter	*1,322,412*	*1,305,086*	*1,369,952*	*2,229,470*	*1,985,592*
Total animal matter	17,576,078	18,155,743	19,002,825	20,473,486	19,635,150
Vegetable matter:					
Cotton	3,005,897	3,962,183	3,428,880	4,332,664	3,419,173
Fruit and vegetables	7,833,914	9,230,535	8,921,262	9,719,117	9,516,962
Grain and grain products—					
Grain	30,493,327	30,906,440	35,856,333	36,715,384	33,058,061
Grain products—					
Flour	7,088,144	6,589,785	7,331,610	7,880,527	6,871,886
Other grain products	4,728,978	4,639,411	5,042,884	5,698,119	5,153,412
Total grain and grain products	42,310,449	42,135,636	48,230,827	50,294,030	45,083,359
Hay	*5,228,475*	*5,191,830*	*5,479,755*	*5,847,828*	*5,446,336*
Sugar	2,600,042	2,573,676	2,793,864	2,610,287	2,589,091
Tobacco	751,297	833,621	882,235	928,151	802,597
Other vegetable matter	*2,382,511*	*3,283,230*	*3,258,761*	*5,908,281*	*5,397,516*
Total vegetable matter	64,112,585	67,210,711	72,995,584	79,640,358	72,255,034
Total farm products	81,688,663	85,366,454	91,998,409	100,113,844	91,890,184
Total, all freight	641,680,547	715,663,442	820,164,627	893,184,972	797,210,099

[a] Original shipments only, excluding freight received by each railway from connecting railways and other carriers.

TRANSPORTATION—Continued.

Average receipts by railroads for freight traffic, per short ton per mile, 1890–1908.

Year ending June 30—	Group.[a]										Total United States.
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1890	1.373	0.828	0.695	0.844	1.061	0.961	1.360	1.152	1.303	1.651	0.941
1891	1.439	.760	.690	.852	1.018	.858	1.333	1.217	1.363	1.631	.895
1892	1.308	.755	.674	.811	.958	.983	1.293	1.159	1.328	1.646	.898
1893	1.298	.758	.663	.763	.927	.962	1.212	1.098	1.128	1.507	.878
1894	1.243	.754	.636	.730	.933	.942	1.141	1.054	1.209	1.343	.860
1895	1.223	.698	.642	.670	.895	.961	1.098	1.161	1.253	1.261	.839
1896	1.213	.672	.618	.660	.886	.917	1.121	1.055	1.118	1.254	.806
1897	1.202	.675	.605	.648	.864	.855	1.148	1.079	1.040	1.275	.798
1898	1.176	.617	.578	.592	.835	.826	1.157	.961	1.042	1.146	.753
1899	1.123	.582	.529	.594	.807	.821	1.101	.968	1.065	1.136	.724
1900	1.152	.613	.546	.595	.808	.806	1.064	.964	.938	1.067	.729
1901	1.151	.646	.568	.641	.802	.789	1.043	.971	1.018	1.055	.750
1902	1.172	.664	.576	.650	.816	.787	.994	.978	.984	1.037	.757
1903	1.167	.667	.607	.714	.827	.774	.980	.962	.974	1.005	.763
1904	1.196	.686	.620	.716	.851	.779	.964	.998	1.000	1.036	.780
1905	1.179	.665	.607	.691	.839	.766	.900	.988	1.096	1.098	.766
1906	1.172	.650	.594	.690	.813	.745	.894	.947	1.009	1.103	.748
1907	1.145	.655	.598	.703	.827	.743	.933	.966	1.051	1.163	.759
1908	1.110	.643	.594	.696	.825	.735	.942	.953	1.002	1.204	.754
Mean:											
1891–1895	1.302	.745	.661	.765	.946	.941	1.215	1.138	1.256	1.478	.874
1896–1900	1.173	.632	.575	.618	.840	.845	1.118	1.005	1.041	1.176	.762
1901–1905	1.173	.666	.596	.682	.827	.779	.976	.979	1.014	1.046	.763

[a] Group I comprises the railroads of the New England States; Group II, New York (east of Buffalo), Pennsylvania (east of Pittsburg), New Jersey, Delaware, Maryland, and northern part of West Virginia; Group III, New York (west of Buffalo), Pennsylvania (west of Pittsburg), Ohio, Indiana, and the southern peninsula of Michigan; Group IV, Virginia, central and southern West Virginia, North Carolina and South Carolina; Group V, Kentucky, Tennessee, Georgia, Florida, Alabama, Mississippi, and Louisiana (east of the Mississippi River); Group VI, northern peninsula of Michigan, Wisconsin, Illinois, Minnesota, Iowa, Missouri (north of the Missouri River), North Dakota (east of the Missouri River), and South Dakota (east of the Missouri River); Group VII, North Dakota (west of the Missouri River), South Dakota (west of the Missouri River), Nebraska, Montana, Wyoming, and northern Colorado; Group VIII, Missouri (south of Missouri River), Arkansas, Kansas, Oklahoma, central and southern Colorado, northeastern New Mexico, and the "panhandle" of Texas; Group IX, Texas (except the "panhandle") and southeastern New Mexico; Group X, Idaho, Utah, Nevada, western New Mexico, Arizona, Oregon, Washington, and California.

TRANSPORTATION—Continued.

Corn and wheat: Mean rates, per bushel, Chicago to New York, 1876–1909.

[Data furnished by the Chicago Board of Trade.]

Year.	Corn.			Wheat.		
	By lake and canal.[a]	By lake and rail.	By all rail.	By lake and canal.[a]	By lake and rail.	By all rail.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1876	8.75	5.68	14.12	9.82	10.19	15.12
1877	9.59	13.42	18.03	11.06	14.75	19.56
1878	8.82	10.45	16.39	9.96	11.99	17.56
1879	10.49	12.20	14.56	11.87	13.13	17.74
1880	13.41	14.43	17.48	12.13	15.80	19.80
1881	7.77	9.42	13.40	8.67	10.49	14.40
1882	6.72	10.28	13.50	7.23	10.91	14.47
1883	8.03	11.00	15.12	9.01	11.63	16.20
1884	6.55	8.50	12.32	7.00	10.00	13.20
1885	6.30	8.01	12.32	6.54	9.02	13.20
1886	8.45	11.20	14.00	9.10	12.00	15.00
1887	8.50	11.20	14.70	9.50	12.00	15.75
1888	6.71	10.26	13.54	7.05	11.1[illegible]	14.50
1889	6.32	8.19	12.60	6.92	8.97	15.00
1890	5.93	7.32	11.36	6.76	8.52	14.30
1891	6.32	7.53	14.00	6.95	8.57	15.00
1892	5.95	7.21	12.96	6.45	7.59	13.80
1893	7.18	7.97	13.65	7.66	8.48	14.63
1894	4.93	6.50	12.32	5.11	7.00	13.20
1895	4.50	6.40	10.29	4.86	6.96	11.89
1896	5.75	6.15	10.50	6.19	6.61	12.00
1897	4.53	6.92	11.43	5.22	7.42	12.50
1898	[b]3.81	4.41	9.80	[b]4.45	4.91	12.00
1899	[b]5.08	5.83	10.08	[b]5.81	6.63	11.60
1900	[b]4.07	4.72	9.19	[b]4.49	5.10	9.06
1901	[b]4.61	5.16	9.21	[b]5.11	5.54	9.88
1902	[b]4.83	5.51	9.94	[b]5.26	5.89	10.62
1903	[b]4.85	5.78	10.54	[b]5.40	6.37	11.29
1904	[b]3.63	4.82	10.38	[b]4.73	5.50	11.12
1905	[b]4.76	5.19	9.40	[b]5.53	6.40	9.90
1906	[b]5.51	5.72	9.52	[b]6.03	6.35	10.20
1907	[b]6.12	6.20	10.17	[b]6.65	7.09	10.90
1908	[b]5.62	5.79	9.89	[b]6.05	6.60	10.60
1909	[b]4.87	5.89	9.30	[b]5.24	6.49	9.96
Mean:						
1876–1880	10.21	12.04	16.12	11.17	13.17	17.96
1881–1885	7.07	9.44	13.33	7.69	10.41	14.29
1886–1890	7.18	9.63	13.24	7.87	10.53	14.91
1891–1895	5.78	7.12	12.64	6.21	7.72	13.70
1896–1900	[c]4.65	5.61	10.20	[c]5.23	6.13	11.61
1901–1905	[b]4.54	5.29	9.89	[b]5.21	5.94	10.56

[a] Including Buffalo charges and tolls.
[b] Excluding Buffalo charges.
[c] Including, in 1896 and 1897, Buffalo charges and tolls.

TRANSPORTATION—Continued.

Corn and wheat: Mean proportional export freight rates per 100 pounds from Kansas City and Omaha, by rail, to leading Gulf and Atlantic ports, 1905–1909.

Destination and article.	From Kansas City.					From Omaha.				
	1905.	1906.	1907.	1908.	1909.	1905.	1906.	1907.	1908.	1909.
New Orleans:	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
Corn	14.8	[a] 16.5	16.9	17.5	17.5	15.8	[a] 17.5	17.9	18.5	18.5
Wheat	[b] 16.1	[a] 17.1	17.9	18.5	18.5	[b] 17.4	[a] 18.1	18.9	19.5	19.5
Galveston:										
Corn	14.8	16.5	16.9	17.5	17.5	15.8	17.5	17.9	18.5	18.5
Wheat	[b] 16.1	17.1	17.9	18.5	18.5	[b] 17.4	18.1	18.9	19.5	19.5
Boston:										
Corn	22.2	23.4	23.4	24.0	24.0	22.2	23.4	23.4	24.0	24.0
Wheat	[c] 25.0	[d] 21.5	24.4	25.0	25.0	[c] 25.0	[d] 21.5	24.4	25.0	25.0
New York:										
Corn	22.2	23.4	23.4	24.0	24.0	22.2	23.4	23.4	24.0	24.0
Wheat	[c] 25.0	[d] 21.5	24.4	25.0	25.0	[c] 25.0	[d] 21.5	24.4	25.0	25.0
Philadelphia:										
Corn	21.2	22.4	22.4	23.0	23.0	21.2	22.4	22.4	23.0	23.0
Wheat	[c] 24.0	[d] 20.5	23.4	24.0	24.0	[c] 24.0	[d] 20.5	23.4	24.0	24.0
Baltimore:										
Corn	20.7	21.9	21.9	22.5	22.5	20.7	21.9	21.9	22.5	22.5
Wheat	[c] 23.5	[d] 20.0	22.9	23.5	23.5	[c] 23.5	[d] 20.00	22.9	23.5	23.5

[a] From Apr. 25 to Aug. 10, 1906, inclusive, rates used in computing this average include delivery on board ship.
[b] For July 25 to Dec. 31, 1905, inclusive.
[c] For second half of 1905 only.
[d] Average based upon rates in force for two periods, amounting together to about 30 days.

Meats, packed, Cincinnati to New York, by rail: Mean rates, per 100 pounds, 1881–1909.

Year.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1881	35.0	35.0	35.0	30.5	30.5	25.7	21.5	21.5	21.5	21.5	21.5	21.5	26.7
1882	....	21.5	24.3	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	30.5	25.8
1883	30.5	30.5	30.5	29.2	26.0	26.0	26.0	26.0	26.0	26.0	26.7	30.5	27.8
1884	30.5	30.5	23.3	17.5	17.5	18.4	23.0	26.0	26.0	26.0	26.0	26.0	24.2
1885	24.4	21.5	20.0	20.6	18.5	17.5	17.5	21.5	21.5	21.5	22.8	26.0	21.1
1886	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	27.7	26.1
1887	30.5	30.5	30.5	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	27.1
1888	28.0	28.5	26.3	26.0	26.0	26.0	19.9	17.3	15.5	18.8	21.5	23.6	23.1
1889	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1890	26.0	26.0	26.0	26.0	26.0	26.0	26.0	24.8	20.0	20.0	20.0	20.0	23.9
1891	20.0	24.3	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.4
1892	26.0	26.0	26.0	26.0	26.0	25.7	21.5	21.5	21.5	21.5	21.5	21.5	23.7
1893	21.5	23.7	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.4
1894	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1895	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1896	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1897	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1898	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1899	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	21.5	21.5	21.5	24.9
1900	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1901	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1902	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1903	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1904	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1905	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	23.0	21.5	21.5	25.0
1906	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1907	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
1908	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
1909	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Mean:													
1881–1885	30.1	27.8	26.6	24.8	23.7	22.7	22.8	24.2	24.2	24.2	24.6	26.9	25.1
1886–1890	27.3	27.4	27.0	26.0	26.0	26.0	24.8	24.0	22.7	23.4	23.9	24.7	25.3
1891–1895	23.9	25.2	26.0	26.0	26.0	25.9	25.1	25.1	25.1	25.1	25.1	25.1	25.3
1896–1900	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.1	25.1	25.1	25.8
1901–1905	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	25.4	25.1	25.1	25.8

TRANSPORTATION—Continued.

Live stock and dressed meats, Chicago to New York, by rail: Mean rates, per 100 pounds, 1881-1909.

Year.	Cattle.	Hogs.	Sheep.	Horses and mules.	Dressed beef.	Dressed hogs. Refrigerator cars.	Dressed hogs. Common cars.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1881	35	31	61	60	56	....	....
1882	36	29	53	60	57	....	....
1883	40	32	50	60	64	....	....
1884	31	28	44	60	51	....	....
1885	31	26	43	60	54	....	....
1886	33	30	42	60	61	53	48
1887	33	32	40	60	62	59	54
1888	22	26	31	60	46	46	44
1889	25	30	30	60	47	47	45
1890	23	28	30	60	39	39	39
1891	27	30	30	60	45	45	45
1892	28	28	30	60	45	45	45
1893	28	20	30	60	45	45	45
1894	28	30	30	60	45	45	45
1895	28	30	30	60	45	45	45
1896	28	30	30	60	45	45	45
1897	28	30	30	60	45	45	45
1898	28	30	30	60	45	45	45
1899 [a]	25	25	25	60	40.0	40.0	40.0
1900	28	30	30	60	45.0	45.0	45.0
1901	28	30	30	60	42.9	42.9	42.9
1902	28	30	30	60	41.2	41.2	41.2
1903	28	30	30	60	45.0	45.0	45.0
1904	28	30	30	60	45.0	45.0	45.0
1905	28	30	30	60	45.0	45.0	45.0
1906	28	30	30	60	45.0	45.0	45.0
1907	28	30	30	60	45.0	45.0	45.0
1908	28	30	30	60	45.0	45.0	45.0
1909	28	30	30	60	45.0	45.0	45.0
Mean:							
1881-1885	34.6	29.2	50.2	60	56.4	....	....
1886-1890	27.2	29.2	34.6	60	51.0	48.8	46.0
1891-1895	27.8	27.6	30.0	60	45.0	45.0	45.0
1896-1900	27.4	29.0	29.0	60	44.0	44.0	44.0
1901-1905	28.0	30.0	30.0	60	43.8	43.8	43.8

[a] Rates did not go into effect until February 1, 1899. Up to that time the 1898 rates governed.

Mean rates on grain, flour, and provisions, per 100 pounds, through from Chicago to European ports, by all rail to seaboard and thence by steamers, 1900-1909.

[Data furnished by the Chicago Board of Trade.]

Destination.	Article.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
Liverpool	Grain	29.48	21.47	20.85	22.68	20.19	19.16	18.75	19.22	19.01	18.93
Do	Sacked flour	27.90	23.00	23.50	25.19	21.00	22.40	20.50	21.25	20.75	20.72
Do	Provisions	48.84	36.00	36.25	41.90	36.56	38.49	41.00	40.85	42.57	45.38
Glasgow	Grain	30.98	24.10	21.75	24.43	22.38	20.00	19.25	19.67	18.63	18.00
Do	Sacked flour	31.56	24.38	22.75	25.38	23.20	22.50	23.60	23.91	22.08	21.00
Do	Provisions	55.31	45.16	41.88	46.88	44.06	43.23	45.63	46.88	46.88	46.88
London	Grain	31.10	23.23	21.75	23.56	21.50	20.23	19.25	20.54	19.46	18.17
Do	Sacked flour	35.01	25.50	24.00	25.19	22.25	23.64	22.50	23.63	23.16	21.50
Do	Provisions	55.87	44.75	39.06	44.06	44.06	40.88	46.26	46.26	46.26	47.46
Antwerp	do	51.09	46.25	41.50	49.69	48.28	43.70	47.61	45.56	49.59	49.42
Hamburg	do	50.00	44.00	39.00	47.00	46.00	45.75	49.00	46.00	49.59	49.09
Amsterdam	do	51.00	45.00	40.00	42.00	42.00	45.42	46.00	45.00	45.00	48.00
Rotterdam	do	51.00	45.00	40.00	42.00	42.00	44.53	46.00	45.00	45.00	47.00
Copenhagen	do	55.31	47.75	42.00	49.69	46.88	48.66	51.00	51.00	53.96	55.31
Stockholm	do	64.50	53.25	45.00	52.50	49.69	51.47	53.50	53.00	54.66	56.72
Stettin	do	55.31	47.75	42.00	49.69	46.88	48.18	50.00	49.00	51.85	53.91
Bordeaux	do	64.12	54.25	51.25	56.25	56.25	51.45	53.00	55.00	55.00	55.00

TRANSPORTATION—Continued.

Compressed cotton: Mean rates, per 100 pounds from New Orleans and Memphis, by rail, to North Atlantic ports, 1881–1909.

Year.	From New Orleans to—: Boston.	From New Orleans to—: New York.	From New Orleans to—: Philadelphia.	From New Orleans to—: Baltimore.	From Memphis to: New York.	From Memphis to: Boston.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1881	58	53	54	54	66.0	71.0
1882	53	48	51	51	61.0	66.0
1883	60	55	53	52	72.0	77.0
1884	60	55	53	52	54.0	59.0
1885	60	55	53	52	56.6	58.0
1886	52	47	45	44	53.0	58.0
1887	50	45	43	42	53.0	58.0
1888	50	45	43	42	47.0	52.0
1889	52	47	45	44	50.5	55.0
1890	55	50	50	50	50.5	55.0
1891	55	50	50	50	50.5	55.0
1892	55	50	50	50	50.5	55.0
1893	55	50	50	50	47.0	52.0
1894	51	50	50	50	50.5	55.5
1895	53	48	48	48	50.5	55.5
1896	55	50	50	50	50.5	55.5
1897	55	50	50	50	50.0	55.0
1898	55	50	50	50	47.0	52.0
1899	52	47	47	47	48.0	53.0
1900	55	50	50	50	50.5	55.5
1901	55	50	50	50	50.5	55.5
1902	55	50	50	50	50.5	55.5
1903	55	50	50	50	50.5	55.5
1904	55	50	50	50	50.5	50.5
1905	55	50	50	50	40.5	45.5
1906	55	50	50	50	40.5	45.5
1907	55	50	50	50	40.5	45.5
1908	55	50	50	50	42.5	47.5
1909	55	50	50	50	42.5	47.5
Mean						
1881–1885	58.2	53.2	52.8	52.2	61.8	66.2
1886–1890	51.8	46.8	45.2	44.4	50.8	55.6
1891–1895	53.8	49.6	49.6	49.6	49.8	54.6
1896–1900	54.4	49.4	49.4	49.4	49.2	54.2
1901–1905	55.0	50.0	50.0	50.0	48.5	52.5

Quotations of ocean freight rates on grain (except oats), cotton, and lard from United States ports to Liverpool, 1909.

[The rates in this table on grain (except oats) from Baltimore were computed from data furnished by the Baltimore Chamber of Commerce; all other rates were computed from quotations made by freight brokers and transportation companies.]

Article and port.	Mean for month.												Mean for year.
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Grain, except oats (per 60 pounds):	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
Boston	3.78	2.89	2.62	2.62	2.62	2.10	2.10	2.62	2.62	3.96	4.86	4.94	3.15
New York[a]	3.28	3.15	3.15	3.15	3.15	3.41	3.57	3.15	2.76	3.78	4.86	4.72	3.51
Baltimore[a]	4.20	2.62	2.10	2.62	2.36	2.10	2.89	2.89	2.62	2.89	...	5.25	2.96
New Orleans	5.25	5.25	4.72	4.72	4.72	4.72	4.72	5.78	5.46	5.78	5.78	6.30	5.27
Galveston	3.75	3.75	3.75	4.50	5.00	5.00	5.00	5.00	6.00	6.00	5.50	5.50	4.90
Cotton (per 100 pounds):													
Boston	11.6	10.0	10.0	10.0	10.0	10.0	10.0	12.0	12.0	12.0	12.0	12.0	11.0
New York	12.0	12.0	12.0	12.0	13.2	14.0	16.3	13.9	14.0	14.0	13.5	13.5	13.4
Baltimore	20.0	20.0	20.0	20.0	20.0	12.0	12.0	12.0	15.5	16.0	16.0	16.0	16.6
New Orleans	26.0	26.0	25.7	27.0	28.0	28.0	28.0	29.0	28.8	29.5	30.0	30.0	28.0
Galveston	26.0	26.0	22.5	21.0	26.5	28.0	28.0	28.0	27.5	27.5	27.5	26.5	26.2
Lard, small packages (per 100 pounds):													
Boston	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
New York	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Baltimore	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
New Orleans	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	24.6	25.0	27.5	30.0	24.3
Galveston	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0

a Preliminary.

TRANSPORTATION—Continued.

Mean annual quotations of ocean freight rates per 100 pounds on grain (except oats) and cotton from various United States ports to Europe, 1886–1909.

[The rates in this table for grain (except oats) from New York were computed from data in the annual reports of the New York Produce Exchange, except for the last year; from Baltimore, from reports of the Baltimore Chamber of Commerce. All other figures were computed from rates quoted in newspapers and in circulars issued by freight brokers and transportation companies.]

Calendar year.	Grain (except oats).				Cotton.					
	To Liverpool from—			To Cork for orders, from San Francisco.	To Liverpool from—			To Bremen from—		
	New York.	Baltimore.	New Orleans.		New York.	Savannah.	New Orleans.	New York.	Savannah.	New Orleans.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1886	11.6	12.7	16.1	33.0	31.0	54.7	61.6	36.3	60.5	64.7
1887	8.8	10.3	15.0	29.0	27.7	62.4	59.2	38.3	63.8	68.2
1888	9.2	10.7	14.4	27.7	28.4	74.4	60.1	37.2	84.0	71.5
1889	13.8	15.5	19.0	33.1	41.9	80.6	71.0	68.6	83.6	78.8
1890	8.5	9.8	12.9	37.9	28.0	63.8	51.6	46.7	68.9	59.8
1891	10.9	11.9	14.8	43.2	31.3	64.2	46.7	37.6	71.5	49.5
1892	9.2	11.6	12.5	33.7	23.4	38.1	38.9	....	52.2	49.1
1893	8.3	10.0	13.6	22.6	26.8	43.9	40.5	35.5	44.3	45.2
1894	6.8	8.4	9.7	28.3	25.7	42.3	39.9	32.0	42.7	47.8
1895	9.0	7.5	10.3	28.1	21.2	36.2	34.9	27.4	36.9	41.9
1896	10.3	10.2	14.2	28.7	24.4	51.0	38.3	29.6	43.1	45.9
1897	10.7	11.1	13.4	26.8	20.4	42.3	34.0	30.3	44.0	42.7
1898	12.0	12.5	16.2	22.1	26.2	46.5	46.2	34.1	43.2	51.9
1899	8.5	10.1	13.1	27.9	18.7	37.8	38.7	28.1	37.1	44.8
1900	11.8	13.5	17.3	40.2	28.0	46.2	51.0	36.2	46.6	54.2
1901	4.4	6.3	8.7	41.5	13.4	31.4	32.5	23.2	30.1	37.6
1902	5.0	6.2	7.2	32.1	12.5	26.6	28.7	18.3	24.1	30.5
1903	5.0	5.4	8.3	18.5	14.8	26.8	34.6	23.3	26.1	33.8
1904	3.9	4.8	8.8	15.8	13.7	28.4	31.4	21.9	25.4	31.9
1905	5.7	6.4	10.6	23.2	16.6	27.8	33.8	21.2	26.6	32.7
1906	5.0	6.1	11.4	25.0	17.0	30.4	34.2	21.3	31.0	36.2
1907	6.1	6.3	11.8	24.8	18.6	31.3	35.9	20.5	32.4	36.6
1908	5.5	6.5	10.1	25.6	13.7	31.9	29.9	21.0	32.0	30.6
1909	a 5.9	a 4.9	8.8	25.5	13.4	25.4	28.0	17.7	25.1	28.0
Mean:										
1886–1890	10.4	11.8	15.5	32.1	31.4	67.2	60.7	45.4	72.2	68.6
1891–1895	8.8	9.9	12.2	31.2	25.7	44.9	40.2	b 33.1	49.5	46.7
1896–1900	10.7	11.5	14.8	29.1	23.5	44.8	41.6	31.7	42.8	47.9
1901–1905	4.8	5.8	8.7	26.2	14.2	28.2	32.2	21.6	26.5	33.3

a Preliminary.

b Mean, 1891, 1893–1895.

IMPORTS AND EXPORTS OF AGRICULTURAL PRODUCTS.[a]

Agricultural imports of the United States during the five years ending June 30, 1909

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER.										
Animals, live:										
Cattle—										
For breeding purposes, number.	2,314	$93,084	829	$118,368	835	$122,230	3,188	$149,142	3,049	$140,713
Other ....do....	25,541	365,488	28,190	430,062	31,567	442,892	89,168	1,358,168	136,135	1,858,709
Total cattle............do...	27,855	458,572	29,019	548,430	32,402	565,122	92,356	1,507,310	139,184	1,999,422
Horses—										
For breeding purposes...do....	2,853	1,169,011	3,377	1,266,987	3,644	1,574,020	3,562	1,325,784	4,953	1,658,640
Other ....do....	2,327	422,072	2,644	449,688	2,436	404,085	1,925	278,608	2,131	348,636
Total horses............do....	5,180	1,591,083	6,021	1,716,675	6,080	1,978,105	5,487	1,604,392	7,084	2,007,276
Sheep—										
For breeding purposes...do....	2,200	45,319	2,679	53,951	3,081	67,555	5,600	104,509	4,860	89,272
Other ....do....	184,742	659,402	238,068	966,408	221,717	1,052,870	219,165	978,097	97,803	413,368
Total sheep............do....	186,942	704,721	240,747	1,020,359	224,798	1,120,425	224,765	1,082,606	102,663	502,640
All other, including fowls..........	....	583,078	....	628,958		680,630		583,151		528,333
Total live animals...............	....	3,337,454	....	3,914,422		4,344,282		4,777,459		5,037,671
Beeswax..................pounds.	373,569	101,121	587,617	168,014	917,088	284,637	[illegible]	[illegible]	[illegible]	231,559
Cochineal.....................do...	84,332	36,876	111,007	53,446	(b)	(b)	(b)	(b)	(b)	(b)
Dairy products:										
Butter.....................do...	593,104	124,136	196,642	57,955	441,755	117,835	[illegible]	[illegible]	[illegible]	141,917
Cheese....................do....	23,095,705	3,379,600	27,286,866	4,303,830	33,848,766	5,704,012	[illegible]	[illegible]	[illegible]	5,866,154
Milk...........................	....	23,014	....	10,858		10,188		[illegible]		23,428
Total dairy products............	....	3,526,750	....	4,372,643		5,832,035		[illegible]		6,031,499

[a] Forest products come within the scope of the Department of Agriculture and are therefore included in alphabetical order in these tables.

[b] Not stated.

Agricultural imports of the United States during the five years ending June 30, 1909—Continued.

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER—continued.										
Eggs .... dozens..	352,303	$38,541	241,034	$21,200	231,859	$26,276	231,939	$25,850	288,650	$36,937
Egg yolks	....	37,036	....	10,992	....	10,610	....	10,845	....	6,232
Feathers and downs, crude	....	2,036,791	....	2,970,260	....	4,401,131	....	4,360,721	....	5,507,974
Fibers, animal:										
Silk—										
Cocoons .... pounds..	28,546	7,875	33,592	11,452	71,223	23,807	187	292	14,016	3,931
Raw, or as reeled from the cocoon .... pounds..	17,812,133	59,542,892	14,505,324	52,855,611	16,722,207	70,229,518	15,424,041	63,665,534	23,333,750	78,830,568
Waste .... do....	4,515,628	1,489,286	2,813,105	1,213,441	1,950,474	1,158,574	1,237,904	881,077	1,840,191	1,069,087
Total silk .... do....	22,357,307	61,040,053	17,352,021	54,080,504	18,743,904	71,411,899	16,662,132	64,546,903	25,187,957	79,903,586
Wool, and hair of the camel, goat, alpaca, and like animals—										
Class 1, clothing ...... pounds..	109,888,258	24,762,682	86,810,307	20,936,934	82,982,116	21,378,304	45,798,303	10,278,199	142,580,993	29,455,598
Class 2, combing .... do....	26,551,624	6,521,171	15,204,254	4,214,024	10,671,378	3,235,281	13,332,540	3,624,617	21,952,259	4,591,559
Class 3, carpet .... do....	112,695,864	14,941,705	99,674,107	13,917,414	110,194,051	16,920,443	66,849,681	9,762,122	101,876,052	11,124,837
Total wool .... do....	249,135,746	46,225,558	201,688,668	39,068,372	203,847,545	41,534,028	125,980,524	23,664,938	266,409,304	45,171,994
Total animal fibers .... do....	271,493,053	107,265,611	219,040,689	93,148,876	222,591,449	112,945,927	142,642,656	88,211,841	291,597,261	125,075,580
Gelatin .... do....	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	1,247,910	387,232
Glue .... do....	7,439,735	701,847	6,558,168	632,700	6,460,312	596,667	6,731,943	629,032	6,610,894	655,127
Honey .... gallons..	198,617	76,719	138,221	50,651	175,672	70,854	211,992	98,425	145,691	60,884
Packing-house products:										
Bladders, other than fish	....	15,837	....	23,915	....	11,835	....	4,905	....	7,354
Blood, dried	....	11,064	....	24,277	....	94,023	....	40,023	....	91,705
Bones, hoofs, and horns	....	926,505	....	1,013,351	....	845,255	....	733,798	....	777,357
Bristles—										
Crude, unsorted ...... pounds..	8,122	4,054	13,435	9,389	11,620	5,325	7,710	7,620	10,129	7,637
Sorted, bunched, or prepared, pounds	2,461,464	2,366,444	2,728,114	2,686,357	3,433,941	3,256,552	2,614,783	2,090,157	2,884,372	2,583,482
Total bristles ..... pounds..	2,469,586	2,370,498	2,741,549	2,695,746	3,445,561	3,261,877	2,622,493	2,097,777	2,894,501	2,591,119
Grease	....	1,170,514	....	1,295,855	....	1,355,739	....	1,103,081	....	1,489,764
Gut	....	62,630	....	85,587	....	103,480	....	113,861	....	128,186

Hair	....	3,328,471	....	3,704,987	....	3,038,906	....	2,770,658	....	3,750,524
Hide cuttings and other glue stock	....	1,120,070	....	1,160,683	....	1,473,188	....	1,265,382	....	1,301,956
Hides and skins, other than furs—										
Cattle hides .... pounds	113,177,357	14,949,628	156,155,300	21,862,060	134,671,020	20,649,258	98,353,249	12,044,435	192,252,083	23,795,602
Goatskins .... do	97,803,571	26,945,721	111,079,391	31,773,909	101,201,596	31,715,298	63,640,758	17,325,126	104,048,244	26,023,914
Sheepskins [a] .... do	} 126,893,934	22,868,797	158,045,419	30,246,198	135,111,199	30,841,980	120,770,918	25,400,575	{ 48,906,326	8,276,637
Other .... do									{ 99,347,672	20,391,171
Total hides and skins..do	337,874,862	64,764,146	425,280,110	83,882,167	370,983,815	83,206,545	282,764,925	54,770,136	444,554,325	78,487,324
Meat—										
Sausages, bologna	(b)	147,119	744,634	149,593	451,050	121,205	520,770	108,367	560,873	129,568
Other, including meat extracts	....	674,441	....	675,568	....	888,209	....	775,713	....	667,367
Total meat	....	821,560	....	825,161	....	1,009,414	....	884,080	....	796,935
Oils .... gallons	175,620	27,559	160,854	23,914	132,843	26,671	85,964	16,965	(a)	(a)
Rennets	....	99,481	....	93,288	....	117,344	....	151,028	....	97,684
Sausage casings	....	836,323	....	874,203	....	1,288,922	....	2,182,036	....	2,258,648
Stearin .... pounds	2,800,540	191,960	1,700,177	134,196	1,184,287	93,385	1,434,845	135,739	3,895,254	411,485
Other	....	52,223	....	68,843	....	48,188	....	29,968	....	34,722
Total packing-house products	....	75,798,841	....	95,906,263	....	95,974,871	....	66,299,437	....	92,224,742
Total animal matter	....	192,957,587	....	201,249,467	....	224,467,296	....	170,389,478	....	235,255,437
VEGETABLE MATTER.										
Argols, or wine lees .... pounds	26,281,931	2,201,951	28,140,835	2,358,061	30,540,893	2,562,384	26,738,834	2,305,185	32,115,646	2,641,867
Breadstuffs. (*See* Grain and grain products.)										
Broom corn .... tons	3	918	1	777	4	1,663	2	516	1,880	163,645
Cider .... gallons	8,651	8,931	13,644	15,013	8,018	7,842	9,764	11,113	9,704	10,298
Cocoa and chocolate:										
Cocoa—										
Crude, and leaves and shells of .... pounds	73,815,895	8,577,649	80,117,402	8,697,515	92,249,819	13,376,562	82,831,242	14,257,230	129,854,749	14,850,328
Prepared, or manufactured. pounds	874,878	259,037	1,055,031	299,141	1,267,733	371,816	1,016,990	311,681	1,287,109	372,195
Total cocoa .... pounds	74,690,773	8,836,686	81,172,433	8,996,656	93,517,552	13,748,378	83,848,232	14,568,911	131,141,858	15,222,523
Chocolate .... do	2,692,251	647,377	2,954,594	702,717	3,541,961	830,611	2,756,452	715,131	1,519,073	339,795
Total cocoa and chocolate, pounds	77,383,024	9,484,063	84,127,027	9,699,373	97,059,513	14,578,989	86,604,684	15,284,042	132,660,931	15,562,318
Coffee .... pounds	1,047,792,984	84,654,062	851,668,933	73,256,134	985,321,473	78,231,902	890,640,057	57,088,196	1,049,868,768	79,112,129

a Except sheepskins with the wool on.

b Not stated.

Agricultural imports of the United States during the five years ending June 30, 1909—Continued.

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Coffee substitutes:										
Chicory root—										
Raw, unground.........do....	3,340,913	$59,589	3,401,065	$58,502	2,597,807	$41,680	2,170,633	$34,330	6,137,303	$99,389
Roasted, ground, or otherwise prepared...........pounds..	596,095	22,395	546,809	20,560	615,267	25,770	502,792	21,311	644,466	24,947
Total chicory root....do....	3,937,008	81,984	3,947,874	79,062	3,213,074	67,450	2,673,425	55,641	6,781,769	124,336
Other......................do....	244,327	15,407	439,227	28,705	341,486	23,385	431,603	27,621	499,633	28,941
Total coffee substitutes ....do....	4,181,335	97,391	4,387,101	107,767	3,554,560	90,835	3,105,028	83,262	7,281,402	153,277
Curry and curry powder..............	....	8,327	....	10,424	....	14,983	....	14,350	....	10,276
Fibers, vegetable:										
Cotton...................pounds..	60,508,548	9,414,750	70,963,633	10,879,592	104,791,784	19,930,988	71,072,855	14,172,241	86,518,024	13,622,802
Flax.........................tons..	8,089	2,260,421	8,729	2,327,300	8,656	2,254,112	9,528	2,514,680	9,870	2,542,256
Hemp......................do....	3,987	638,325	5,317	906,808	8,718	1,534,371	6,213	1,086,805	5,208	799,164
Istle, or Tampico fiber.......do....	15,607	1,405,184	13,914	1,283,311	14,960	1,369,206	10,174	893,273	9,610	675,887
Jute and jute butts..........do....	98,215	4,500,023	103,945	6,449,684	104,489	8,950,918	107,533	6,504,020	156,685	7,216,307
Manila......................do....	61,562	12,065,270	58,738	11,036,667	54,513	10,876,107	52,467	8,974,617	61,902	7,156,091
Sisal grass..................do....	100,301	15,256,859	98,037	15,282,208	99,061	14,959,415	103,904	14,047,369	91,451	10,215,887
Other......................do....	17,149	1,991,989	18,603	2,074,312	22,580	2,295,229	13,575	1,471,419	10,719	1,142,761
Total vegetable fibers...........	....	47,532,821	....	50,239,882	....	62,170,346	....	49,665,324	....	43,371,155
Flowers, natural......................	....	29,080	....	27,275	....	32,729	....	42,821	....	41,187
Forest products:										
Charcoal.................bushels..	5,643	478	774,501	42,856	144,802	8,516	472,670	37,167	886,297	46,660
Cinchona bark...........pounds..	4,251,869	570,725	4,076,563	383,726	3,515,958	380,552	3,983,825	368,419	3,502,423	263,112
Cork wood or cork bark...........	....	1,729,143	....	1,837,134	....	2,356,052	....	2,092,732	....	2,016,551
Dyewoods, and extracts of—										
Dyewoods—										
Logwood............tons..	35,514	444,824	37,313	496,551	38,230	478,636	21,594	244,400	17,874	166,371
Other......................	....	77,751	....	109,515	....	54,902	....	55,040	....	45,760

Total dyewoods	....	522,575	....	606,066	....	533,538	....	300,400	....	212,131
Extracts and decoctions of, pounds	3,436,642	299,036	3,390,310	290,179	4,796,655	370,927	3,959,049	238,649	3,519,733	232,879
Total dyewoods and extracts of	....	821,611	....	896,245	....	913,465	....	539,049	....	445,010
Guayule plant........pounds	(a)	(a)	(a)	(a)	1,187,596	24,613	1,524,401	28,583	945,789	18,490
Gums—										
Arabic........do	3,651,544	190,132	4,055,233	232,715	7,068,066	393,581	4,890,897	348,883	4,158,958	275,967
Camphor—										
Crude........do	1,904,002	638,744	1,668,744	608,440	3,138,070	1,572,863	2,814,299	1,365,269	1,990,499	602,530
Refined........do	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	451,362	158,297
Chicle........do	5,000,166	1,357,458	5,641,508	1,495,366	6,732,581	2,139,204	6,089,607	2,027,148	5,450,139	1,987,112
Copal, cowrie, and dammar, pounds	25,687,762	2,493,438	20,448,703	1,914,663	26,681,736	2,835,332	24,966,693	2,813,515	24,861,428	2,388,458
Gambier, or terra japonica, pounds	32,192,731	1,112,660	31,278,485	1,118,910	28,865,617	977,009	26,681,791	894,752	30,992,245	1,313,997
India rubber, gutta-percha, etc.—										
Balata........pounds	(a)	(a)	374,220	152,680	799,201	305,041	584,552	276,756	1,157,018	522,872
Gutta-joolatong, or East Indian gum.....pounds	19,104,911	641,319	21,390,116	733,074	28,437,660	1,085,098	22,803,303	1,039,776	24,826,296	852,372
Gutta-percha........do	665,217	210,188	500,770	188,161	546,590	201,339	188,610	100,305	255,559	82,136
India rubber........do	67,234,256	49,878,366	57,844,345	45,114,450	76,963,838	58,919,981	62,233,160	36,613,185	88,359,895	61,709,723
Total India rubber, etc., pounds	87,004,384	50,729,873	80,109,451	46,188,374	106,747,589	60,511,459	85,809,625	38,030,022	114,598,768	63,167,103
Shellac........pounds	10,700,817	3,743,180	15,780,090	5,107,542	17,785,960	5,821,688	13,361,932	4,143,974	19,185,137	3,889,533
Other	....	1,094,869	....	1,423,088	....	1,234,479	....	939,952	....	1,393,470
Total gums	....	61,360,354	....	58,089,098	....	75,485,615	....	50,563,515	....	75,176,493
Ivory, vegetable........pounds	19,688,913	410,883	21,076,508	516,607	16,602,229	404,931	14,536,288	375,535	20,002,909	609,062
Naval stores—										
Tar and pitch (of wood), barrels	574	3,206	1,363	6,504	1,330	6,928	2,523	9,797	1,018	5,150
Turpentine, spirits of gallons	43,063	13,546	158,730	59,273	35,386	16,110	76,743	29,210	51,137	17,538
Total naval stores	....	16,752	....	65,777	....	23,038	....	39,007	....	22,688
Palm leaf, natural	....	9,434	....	8,114	....	14,779	....	36,855	....	17,354
Tanning materials—										
Hemlock bark........cords	13,511	64,181	7,467	35,860	6,744	30,757	8,868	43,500	20,373	128,560
Mangrove bark........tons	(a)	(a)	(a)	(a)	20,693	426,431	15,192	310,745	12,263	250,409

a Not stated.

Agricultural imports of the United States during the five years ending June 30, 1909—Continued.

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Forest products—Continued.										
Tanning materials—Continued.										
Quebracho, extract of..pounds..	(a)	(a)	(a)	(a)	79,033,584	$2,319,785	79,186,787	$2,260,364	102,004,981	$2,740,530
Quebracho wood..........tons..	(a)	(a)	(a)	(a)	66,810	840,779	48,871	612,971	66,113	731,795
Sumac, ground........pounds..	15,583,334	$225,036	15,131,539	$237,309	12,487,103	267,239	8,576,091	227,611	10,974,613	293,249
Other..........................	....	923,949	....	1,419,962	....	84,406	....	125,376	....	177,716
Total tanning materials......	....	1,213,108	....	1,693,131	....	3,969,397	....	3,580,959	....	4,320,259
Wood, not elsewhere specified—										
Cabinet woods, unsawed—										
Mahogany.........M feet..	31,844	1,977,894	36,619	2,470,072	51,899	3,263,718	41,678	2,566,954	39,828	2,479,976
Other..........................	....	1,077,723	....	1,334,748	....	2,091,882	....	1,464,907	....	1,406,318
Total cabinet woods....	....	3,055,617	....	3,804,820	....	5,355,600	....	4,031,861	....	3,886,294
Logs and round timber..M feet..	97,306	722,693	100,592	773,260	97,573	938,501	131,348	1,264,439	155,095	1,510,767
Lumber—										
Boards, deals, planks, and other sawed lumber, M feet..........................	710,538	10,906,661	949,717	14,813,733	934,195	16,255,350	791,288	15,212,788	846,024	15,940,755
Shingles...............M..	758,725	1,581,421	900,856	1,852,612	881,003	1,940,001	968,081	2,379,242	1,058,383	2,500,398
Other..........................	....	1,649,314	....	2,700,505	....	2,764,015	....	2,665,428	....	2,452,888
Total lumber............	....	14,137,396	....	19,366,850	....	20,959,366	....	20,257,458	....	20,900,041
Pulp wood..............cords..	(a)	(a)	(a)	(a)	650,366	2,792,751	923,503	4,989,919	727,104	4,333,905
Timber, hewn, squared, or sided.............cubic feet..	184,742	28,912	256,180	46,770	}	} 2,384,743	....	} 2,214,268	....	} 1,724,177
All other..........................	....	4,102,436	....	4,353,034						
Total wood, n. e. s..........	....	22,047,054	....	28,344,734	....	32,430,961	....	32,757,945	....	32,355,184
Wood pulp—										
Chemical—										
Bleached.........pounds..	} 375,208,960	} 4,500,955	} 352,181,760	} 4,584,942	} 477,366,400	} 6,348,857	} 532,031,360	} 7,313,326	85,025,346	2,092,483
Unbleached.........do....									208,940,457	4,478,903
Mechanical..............do....									260,279,169	2,057,877

Total wood pulp.......do....	375,208,960	4,500,955	352,181,760	4,584,942	477,366,400	6,348,857	532,031,360	7,313,326	614,244,972	8,620,283
Total forest products........	....	92,680,555	....	96,462,364	....	122,420,776	....	97,733,092	....	123,920,126
Fruit juices, n. e. s.:										
Prune juice, or prune wine.gallons..	52,765	37,118	50,237	34,900	52,940	35,068	31,584	25,818	31,223	22,092
Other, including cherry juice.do....	23,574	14,130	40,893	24,661	54,553	35,662	40,467	26,677	31,703	20,734
Total fruit juices, n. e. s..do....	76,339	51,248	91,130	59,561	107,493	70,730	72,051	52,495	62,926	42,826
Fruits:										
Fresh or dried—										
Bananas.............bunches..	(a)	9,897,821	(a)	10,330,302	(a)	11,883,168	37,003,358	11,391,211	36,973,584	11,012,100
Currants.............pounds..	31,742,919	764,289	37,078,311	1,119,146	38,392,779	1,746,941	38,652,656	1,592,018	32,482,111	1,185,106
Dates....................do....	19,257,250	360,483	22,435,672	479,142	31,270,899	850,556	24,958,343	689,190	21,969,218	526,747
Figs......................do....	13,364,107	617,027	17,562,358	722,967	24,346,173	1,136,924	18,836,574	867,523	15,235,513	691,991
Grapes.............cubic feet.	(a)	(a)	(a)	(a)	1,298,469	1,575,521	2,234,508	2,743,356	1,203,419	1,575,620
Lemons...............pounds..	139,084,321	2,905,082	138,717,252	2,933,990	157,859,906	4,253,296	178,490,003	4,388,530	135,183,550	2,623,399
Olives................gallons..	(a)	(a)	(a)	(a)	2,298,480	1,277,973	3,121,788	1,358,897	2,960,329	1,349,023
Oranges..............pounds..	28,880,575	374,088	31,134,341	456,726	21,267,346	354,495	18,397,429	275,060	8,435,873	137,390
Plums and prunes.......do....	671,604	63,617	497,494	53,348	323,377	45,386	335,089	49,322	298,123	41,696
Raisins..................do....	4,041,689	273,031	12,414,856	524,500	3,967,151	364,403	9,132,353	554,633	5,794,320	327,644
Other..........................	....	2,924,187	....	2,484,345	....	1,363,167	....	2,250,813	....	1,912,949
Total fresh or dried........	....	18,179,625	....	19,104,556	....	24,851,832	....	26,160,553	....	21,383,655
Prepared or preserved.............	....	1,599,488	....	2,437,766	....	1,272,445	....	1,550,246	....	1,062,775
Total fruits...............	....	19,779,113	....	21,542,322	....	26,124,277	....	27,710,799	....	22,446,430
Ginger, preserved or pickled...pounds..	436,051	24,874	365,255	19,516	472,190	29,810	409,331	27,189	523,300	34,665
Grain and grain products:										
Grain—										
Barley...............bushels..	81,020	39,546	18,049	9,903	38,319	14,033	199,741	143,407	2,644	1,440
Corn......................do....	15,443	10,623	10,127	8,458	10,818	8,337	20,312	15,536	258,065	189,465
Oats......................do....	38,773	18,626	22,675	10,726	74,552	26,634	364,307	179,714	6,606,989	2,651,699
Rye.......................do....	20,551	13,576	5	4	158	126	17	16	51	51
Wheat....................do....	3,102,585	2,769,317	57,995	53,291	375,433	237,049	341,617	329,766	41,082	36,741
Total grain..........do....	3,258,372	2,851,688	108,851	82,282	499,280	286,179	925,994	668,439	6,908,831	2,879,396
Grain products—										
Macaroni, vermicelli, etc., pounds.......................	53,441,080	2,083,833	77,926,029	2,941,204	87,720,730	3,479,824	97,233,706	4,009,995	85,114,003	3,676,795
Malt.................bushels..	3,298	3,580	2,458	2,711	3,362	3,917	2,625	3,090	1,592	1,992

a Not stated.

Agricultural imports of the United States during the five years ending June 30, 1909—Continued.

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Grain and grain products—Continued.										
Grain products—Continued.										
Meal and flour—										
Oatmeal..........pounds..	304,668	$16,361	312,306	$16,625	301,266	$15,581	344,003	$19,876	444,801	$24,612
Wheat flour.......*barrels*..	40,801	176,513	45,314	177,239	47,702	159,046	39,593	179,295	92,413	446,500
Total meal and flour...	....	192,874	....	193,864	....	174,627	....	199,171	....	471,112
Other..................	....	667,427	....	465,838	....	520,256	....	685,774	....	1,031,030
Total grain products...	....	2,947,714	....	3,603,617	....	4,178,624	....	4,898,030	....	5,180,920
Total grain and grain products............	....	5,799,402	....	3,685,890	....	4,464,803	....	5,566,469	....	8,060,316
Hay..........................tons..	46,214	359,515	68,540	502,051	61,116	501,507	10,063	89,808	6,712	60,854
Hops........................pounds..	4,339,379	1,980,804	10,113,989	2,326,982	6,211,893	1,974,900	8,493,265	1,989,261	7,386,574	1,337,099
Indigo..........................do....	4,830,930	873,781	7,392,853	1,044,148	7,170,057	1,233,541	6,078,073	1,058,354	8,249,972	1,400,286
Licorice root..................do....	108,443,892	1,780,109	102,151,969	1,061,454	66,115,863	1,140,541	109,355,720	1,864,436	97,742,776	1,628,894
Liquors, alcoholic:										
Distilled spirits—										
Of domestic manufacture, returned........proof gallons..	316,469	326,885	177,499	211,129	154,106	162,072	148,298	160,439	134,015	148,776
Brandy...................do....	403,386	1,139,129	470,433	1,286,270	629,333	1,687,473	592,382	1,523,842	764,244	1,961,170
Other.....................do....	2,366,466	3,539,044	2,639,680	4,027,368	3,270,226	5,037,146	3,216,228	4,876,325	3,889,066	5,566,879
Total distilled spirits, proof gallons..................	3,086,321	5,005,058	3,287,612	5,524,767	4,053,665	6,886,691	3,956,908	6,560,606	4,787,325	7,676,825
Malt liquors—										
Bottled...............gallons..	1,362,089	1,285,576	1,582,619	1,466,228	2,041,688	1,902,655	1,960,333	1,829,917	1,801,043	1,695,747
Unbottled..............do....	3,836,487	1,119,768	4,395,032	1,272,627	5,165,929	1,506,108	5,564,773	1,634,754	5,105,062	1,519,660
Total malt liquors...do....	5,198,576	2,405,344	5,977,651	2,738,855	7,207,617	3,408,763	7,525,106	3,464,671	6,906,105	3,215,407
Wines—										
Champagne and other sparkling..........dozen quarts..	371,811	5,723,764	415,394	6,127,062	419,403	6,228,231	366,669	5,221,070	436,628	6,803,785

Still wines—										
Bottled.....dozen quarts..	488,773	2,165,672	546,688	2,209,194	636,938	2,614,346	628,428	2,516,461	650,861	2,574,598
Unbottled.........gallons..	3,973,919	2,352,485	4,482,499	2,567,712	5,213,458	2,966,154	5,443,782	3,008,996	5,747,066	2,838,232
Total still wines........	....	4,518,157	....	4,866,906	....	5,580,500	....	5,525,457	....	5,412,828
Total wines...........	....	10,241,921	....	10,993,968	....	11,808,781	....	10,746,527	....	12,276,613
Total alcoholic liquors..	....	17,652,323	....	19,257,590	....	22,104,235	....	20,771,804	....	23,168,845
Malt, barley. (*See* Grain and grain products.)										
Malt extract, fluid or solid..............	....	5,128	....	2,473	....	3,163	....	21,227	....	4,450
Malt liquors. (*See* Liquors, alcoholic.)										
Meal, cotton-seed..............pounds..	....	....	661,505	4,991	....	....	....	....	....	....
Nursery stock:										
Plants, trees, shrubs, vines, etc.....	....	1,510,435	....	1,599,052	....	1,841,206	....	2,003,973	....	a 1,942,906
Tropical and semitropical fruit plants for propagation, etc........	....	1,631	....	18,570	....	11,328	....	1,912	....	4,001
Total nursery stock............	....	1,512,066	....	1,617,622	....	1,852,534	....	2,005,885	....	1,946,907
Nuts:										
Almonds.................pounds..	11,745,081	1,520,063	15,009,326	1,825,475	14,223,613	2,331,816	17,144,968	2,410,648	11,029,421	1,852,523
Cocoanuts........................	....	1,086,473	....	1,298,740	....	1,349,562	....	1,439,770	....	1,252,594
Cocoanut meat, broken, or copra, pounds..........................	(b)	(b)	(b)	(b)	7,064,532	302,132	14,121,570	481,232	23,842,522	666,820
Cream and Brazil..........bushels..	(b)	(b)	(b)	(b)	252,538	650,488	310,420	754,155	407,719	761,219
Palm, and palm nut kernels.......	....	(b)	....	(b)	....	38,962	....	2,277	....	4,079
Walnuts.................pounds..	21,804,104	1,469,463	24,917,028	2,193,653	32,597,592	2,969,649	28,887,110	2,785,486	26,157,703	2,409,644
Other..............................	....	2,082,344	....	2,055,557	....	2,100,274	....	1,790,375	....	1,717,374
Total nuts.....................	....	6,158,343	....	7,373,425	....	9,742,883	....	9,643,943	....	8,664,253
Oil cake......................pounds..	1,129,013	12,968	5,454,941	54,144	512,654	5,342	2,848,291	27,513	1,742,727	18,456
Oils, vegetable:										
Fixed or expressed—										
Cocoanut oil..........pounds..	(b)	(b)	(b)	(b)	35,544,356	2,623,974	45,422,575	3,267,585	52,490,558	3,079,682
Nut oil, or oil of nuts, n. e. s., gallons......................	(b)	(b)	(b)	(b)	2,453,597	1,040,722	1,869,120	882,983	2,912,965	1,156,132
Olive, for mechanical purposes, gallons......................	(b)	(b)	2,538,366	1,105,876	1,471,706	682,656	1,565,253	703,529	369,970	183,983
Olive, salad...........gallons..	1,923,174	2,108,893	2,447,131	2,566,994	3,449,517	3,523,725	3,799,112	3,876,901	4,129,454	5,069,655
Palm oil..............pounds..	(b)	(b)	(b)	(b)	29,656,207	1,893,285	30,614,875	1,849,611	58,976,379	3,185,028
Other..............................	....	6,010,432	....	6,015,403	....	1,925,300	....	1,788,150	....	1,945,080
Total fixed or expressed......	....	8,119,325	....	9,638,273	....	11,689,662	....	12,469,039	....	14,621,570

a Including $954,399 worth of orchids, palms, dracænas, crotons, azaleas, tulips and other bulbs, bulbous roots, or corms, cultivated for their flowers.

b Not stated.

Agricultural imports of the United States during the five years ending June 30, 1909—Continued.

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Oils, vegetable—Continued.										
Volatile, or essential		$2,534,723		$2,863,005		$3,702,220		$3,645,441		$2,932,512
Total vegetable oils		10,664,048		12,551,278		15,391,882		16,014,500		17,554,082
Olive nuts, ground				5,899						
Opium, crude ... pounds	594,680	1,162,461	469,387	1,143,683	565,252	1,482,649	285,845	1,151,207	517,388	1,951,518
Rice, rice meal, etc.:										
Rice ... do	43,408,509	1,097,099	58,468,791	1,465,487	71,287,151	2,118,147	87,619,202	2,543,417	88,780,442	2,361,310
Rice flour, rice meal, and broken rice ... pounds	63,075,006	913,867	108,079,166	1,616,716	138,316,029	2,273,999	125,164,190	2,255,136	134,119,980	2,336,723
Total rice, etc ... do	106,483,515	2,010,966	166,547,957	3,082,203	209,603,180	4,392,146	212,783,392	4,798,553	222,900,422	4,698,033
Sago, tapioca, etc		761,525		830,479		1,432,082		1,574,835		1,396,090
Seeds:										
Clover ... bushels	(a)	(a)	(a)	(a)	22,849,115	2,385,734	20,659,396	2,323,699	13,786,451	1,202,758
Flaxseed, or linseed ... do	296,184	318,687	52,240	73,423	90,356	124,494	57,419	71,625	593,668	831,871
Other		3,138,932		5,314,620		3,894,548		3,976,146		3,923,390
Total seeds		3,457,619		5,388,043		6,404,776		6,371,470		5,958,019
Spices:										
Unground—										
Nutmegs ... pounds	2,394,061	347,721	2,626,005	342,378	2,375,139	321,719	2,042,396	236,787	2,645,079	219,286
Pepper, black or white, pounds	19,413,387	1,969,521	26,535,834	2,733,137	24,320,865	2,232,774	20,335,693	1,532,901	37,094,824	2,115,413
Other ... pounds	26,115,130	1,731,895	20,037,435	1,429,008	20,374,842	1,838,512	14,332,230	1,194,798	30,497,704	2,114,920
Total unground ... do	47,922,578	4,049,137	49,199,274	4,504,523	47,070,846	4,393,005	36,710,319	2,964,486	70,237,607	4,449,619
Ground ... do	5,106,179	534,219	7,047,685	683,593	6,490,048	719,995	5,414,493	627,051	7,964,336	898,987
Total spices ... do	53,028,757	4,583,356	56,246,959	5,188,116	53,560,894	5,113,000	42,124,812	3,591,537	78,201,943	5,348,606
Spirits, distilled. (*See* Liquors, alcoholic.)										
Starch ... pounds	6,140,753	180,465	5,422,267	156,176	6,330,493	152,0[illegible]0	5,284,050	138,166	17,301,351	424,089

Straw....tons..	2,825	12,700	4,317	16,539	1,497	6,147	1,462	7,659	2,054	12,098
Sugar and molasses:										
Molasses....gallons..	19,477,885	1,187,844	16,021,076	690,718	24,630,935	919,806	18,882,756	721,867	22,092,696	937,791
Sugar—										
Raw—										
Beet....pounds..	223,944,976	4,797,278	48,548,919	1,032,040	397,745,046	8,203,309	221,036,900	5,401,378	98,625,908	2,521,798
Cane....do....	3,434,186,471	91,943,398	3,921,605,729	84,066,863	3,986,510,021	84,273,071	3,144,022,423	74,509,970	4,084,921,078	93,768,598
Total raw....do....	3,658,131,447	96,740,676	3,970,154,648	85,098,903	4,384,255,067	92,476,380	3,365,059,323	79,911,348	4,183,546,986	96,290,396
Refined....do....	22,801,551	904,773	9,176,782	361,185	7,584,908	329,873	6,937,789	346,799	5,874,032	264,602
Total sugar....do....	3,680,932,998	97,645,449	3,979,331,430	85,460,088	4,391,839,975	92,806,253	3,371,997,112	80,258,147	4,189,421,018	96,554,998
Total sugar and molasses.....	....	98,783,293	....	86,150,806	....	93,726,059	....	80,980,014	....	97,492,789
Sugar beet pulp....pounds..	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	1,556,467	12,871
Tea....do....	102,706,599	16,230,858	93,621,750	14,580,878	86,368,490	13,915,544	94,149,564	16,309,870	114,916,520	18,562,676
Tea, waste, etc., for manufacturing, pounds....	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	1,920,918	59,317
Teasels....	....	....	....	10,169	....	9,756	....	10,509	....	8,412
Tobacco:										
Leaf—										
Wrapper....pounds..	7,109,595	5,270,032	6,732,774	6,475,226	7,576,325	8,617,575	5,943,714	6,312,023	5,648,178	5,342,634
Filler and other leaf....do....	26,178,783	12,768,645	30,622,703	15,972,288	31,963,996	17,437,673	26,112,329	16,558,305	36,087,920	20,058,285
Stems....do....	(a)	(a)	3,770,493	15,954	1,358,486	4,737	2,949,088	14,203	1,387,098	4,854
Total tobacco....do....	33,288,378	18,038,677	41,125,970	22,463,468	40,898,807	26,059,985	35,005,131	22,884,531	43,123,196	25,405,773
Vanilla beans....do....	608,116	871,442	852,505	1,321,550	969,249	1,523,156	571,977	1,170,135	1,121,485	1,495,469
Vegetables:										
Fresh or dried—										
Beans and dried pease..bushels..	472,672	628,775	458,041	667,214	406,679	656,898	1,657,401	2,406,935	3,355,405	4,926,199
Onions....do....	856,366	643,207	872,566	615,584	1,126,114	926,115	1,275,333	866,663	574,530	412,127
Potatoes....do....	181,199	168,094	1,948,160	853,063	176,917	192,635	403,952	283,032	8,383,966	3,677,034
Other....	....	646,736	....	815,068	....	1,024,262	....	1,138,429	....	1,104,036
Total fresh or dried....	....	2,086,812	....	2,950,929	....	2,799,910	....	4,695,059	....	10,119,396
Prepared or preserved—										
Pickles and sauces....	....	578,489	....	706,050	....	934,803	....	816,245	....	796,842
Other....	....	1,317,971	....	1,435,953	....	1,993,759	....	2,777,764	....	2,083,559
Total prepared or preserved..	....	1,896,460	....	2,142,003	....	2,928,562	....	3,594,009	....	2,880,401
Total vegetables....	....	3,983,272	....	5,092,932	....	5,728,472	....	8,289,068	....	12,999,797

a Not stated.

Agricultural imports of the United States during the five years ending June 30, 1909—Continued.

Article imported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Vinegar.....gallons..	191,768	$46,434	198,591	$49,319	230,072	$65,282	204,213	$56,671	280,033	$71,867
Wafers, unmedicated.....	.....	19,293	.....	26,353	.....	26,617	.....	28,016	.....	25,316
Wines. (*See* Liquors, alcoholic.)										
Total vegetable matter, including forest products.....	.....	453,574,182	.....	449,388,139	.....	524,790,288	.....	467,033,735	.....	527,277,381
Total vegetable matter, excluding forest products.....	.....	360,893,627	.....	352,925,775	.....	402,369,512	.....	369,300,643	.....	403,357,255
Total agricultural imports, including forest products.....	.....	646,531,760	.....	650,037,606	.....	749,257,584	.....	637,423,213	.....	762,532,818
Total agricultural imports, excluding forest products.....	.....	553,851,214	.....	554,175,242	.....	626,836,809	.....	539,690,121	.....	638,612,692

Agricultural exports (domestic) of the United States during the five years ending June 30, 1909.

Article exported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
ANIMAL MATTER.										
Animals, live:										
Cattle.....number..	567,806	$40,598,048	584,239	$42,081,170	423,051	$34,577,392	349,210	$29,339,134	207,542	$18,046,976
Fowls.....	.....	(a)	.....	(a)	.....	(a)	.....	151,925	.....	115,946
Horses.....number..	34,822	3,175,259	40,087	4,365,981	33,882	4,359,957	19,000	2,612,587	21,616	3,386,617
Mules.....do....	5,826	645,464	7,167	989,639	6,781	850,901	6,609	990,667	3,432	472,017
Sheep.....do....	268,365	1,687,321	142,690	804,090	135,344	750,242	101,000	589,285	67,656	365,155
Swine.....do....	44,496	416,692	59,170	630,908	24,262	309,440	30,818	307,202	18,655	144,605
Other [b].....	.....	205,497	.....	267,690	.....	355,148	.....	110,489	.....	114,122
Total live animals.....	.....	46,728,281	.....	49,139,568	.....	41,203,080	.....	34,101,289	.....	22,645,438
Beeswax.....pounds..	85,406	24,966	101,726	29,894	117,169	36,392	90,506	28,659	77,547	23,293

Dairy products:										
Butter ....do....	10,071,487	1,648,281	27,360,537	4,922,913	12,544,777	2,429,489	6,463,061	1,407,962	5,981,265	1,268,210
Cheese ....do....	10,134,424	1,084,044	16,662,451	1,940,620	17,285,230	2,012,626	8,439,031	1,092,058	6,822,842	857,091
Milk	....	2,156,616	....	1,889,690	....	2,191,111	....	2,455,186	....	1,875,104
Total dairy products	....	4,888,941	....	8,753,223	....	6,633,228	....	4,955,201	....	3,500,405
Eggs ....dozens..	2,475,884	543,386	4,952,063	1,038,649	6,968,985	1,542,789	7,590,977	1,540,014	5,207,151	1,199,522
Egg yolks	....	917	....	54,851	....	11,565	....	9,024	....	23,938
Feathers	....	239,256	....	263,377	....	316,306	....	389,556	....	400,045
Fibers, animal:										
Silk waste ....pounds..	72,451	9,806	71,368	13,781	129,078	37,709	198,736	49,881	300,553	77,944
Wool ....do....	123,951	15,068	192,481	29,095	214,840	48,820	182,458	42,104	28,376	4,668
Total animal fibers ....do....	196,402	24,874	263,849	42,876	343,918	86,529	381,194	91,985	328,929	82,612
Glue ....do....	2,824,202	279,534	3,157,837	208,706	3,481,715	331,998	2,917,173	280,441	2,340,426	244,751
Honey	....	63,367	....	111,945	....	93,690	....	78,102	....	85,578
Packing-house products:										
Beef—										
Canned ....pounds..	66,688,568	6,588,958	64,523,359	6,430,446	15,809,826	1,615,808	23,376,447	2,467,875	14,895,527	1,645,822
Cured—										
Salted or pickled ....do....	55,934,705	3,095,304	81,088,098	4,697,742	62,645,281	3,740,212	46,958,367	3,213,480	44,494,210	3,438,048
Other ....do....	136,476	14,057	199,483	22,063	1,053,287	107,956	937,720	106,470	294,853	34,319
Total cured ....do....	56,071,181	3,109,361	81,287,581	4,719,805	63,698,568	3,848,166	47,896,087	3,319,950	44,789,063	3,472,367
Fresh ....do....	236,486,568	22,138,365	268,054,227	24,310,038	281,651,502	26,367,28[illegible]	201,154,105	20,339,377	122,952,671	12,698,594
Oils—Oleo oil and neutral lard, ...pounds..	145,225,245	11,485,145	209,658,075	17,455,976	195,337,176	16,819,933	212,541,157	19,278,476	179,985,246	19,126,741
Oleomargarine ....pounds.	7,852,164	711,038	11,794,174	1,033,256	5,397,609	520,406	2,938,175	299,745	2,889,058	293,635
Tallow ....do....	63,536,992	3,022,173	97,567,156	4,791,025	127,857,739	7,182,688	91,397,507	5,399,219	53,332,767	3,000,396
Total beef ....do..	575,874,718	47,055,040	732,884,572	58,740,546	689,752,420	58,354,290	579,303,478	51,104,643	418,844,332	40,237,625
Bones, hoofs, horns, and horn tips, strips and waste	....	181,203	....	212,516	....	172,208	....	245,628	....	232,626
Bristles	....	1,497	....	329	....	2,732	....	410	(a)	(a)
Grease, grease scraps, and all soap stock	....	3,710,907	....	4,138,333	....	5,473,623	....	5,762,709	....	4,814,901
Hair	....	778,471	....	854,038	....	938,433	....	1,165,475	....	398,749
Hides and skins, other than furs, ...pounds..	10,268,722	1,051,641	10,752,827	1,222,255	15,396,806	1,760,032	14,650,454	1,538,225	12,858,975	1,271,190
Lard compounds ....pounds.	61,215,187	3,613,235	67,621,310	4,154,183	80,148,861	6,166,910	75,183,210	6,035,418	75,183,196	6,115,307
Meat, canned, n. e. s	....	1,974,693	....	1,593,497	....	745,247	....	1,265,283	....	1,060,222
Mutton ....pounds..	640,837	52,503	516,345	51,103	822,998	83,874	1,185,040	117,688	1,498,674	141,654
Oils, animal, n. e. s ....gallons.	377,777	217,596	338,687	224,991	503,234	292,381	621,300	341,304	614,383	343,828

a Not stated.

b Including "Fowls" prior to July 1, 1907.

Agricultural exports (domestic) of the United States during the five years ending June 30, 1909—Continued.

Article exported.	1905. Quantity.	1905. Value.	1906. Quantity.	1906. Value.	1907. Quantity.	1907. Value.	1908. Quantity.	1908. Value.	1909. Quantity.	1909. Value.
ANIMAL MATTER—continued.										
Packing-house products—Continued.										
Pork—										
Canned .... pounds..	10,254,239	$993,394	12,699,800	$1,215,857	2,710,369	$287,460	4,957,022	$532,442	5,759,930	$620,193
Cured—										
Bacon .... do....	262,246,635	25,428,961	361,210,563	35,845,793	250,418,699	26,470,972	241,189,929	25,481,246	244,578,674	25,920,490
Hams .... do....	203,458,724	21,562,204	194,267,949	20,075,511	209,481,496	23,098,207	221,709,634	25,167,059	212,170,224	23,526,307
Salted or pickled .... do....	118,887,189	9,412,034	141,820,720	11,681,634	166,427,400	15,167,058	149,505,937	13,332,654	52,354,980	4,599,431
Total cured .... do....	584,592,548	56,403,199	697,299,232	67,602,938	626,327,604	65,336,237	612,465,500	63,980,959	509,103,878	54,046,228
Fresh .... do....	14,946,284	1,291,794	13,444,438	1,261,412	11,467,779	1,142,886	16,374,468	1,551,450	9,555,315	638,025
Lard .... do....	610,238,899	47,243,181	741,516,886	60,132,091	627,559,660	57,497,980	603,413,770	54,789,748	528,722,933	52,712,569
Oils—Lard oil .... gallons..	260,797	154,409	298,103	180,474	234,730	144,063	259,062	169,625	234,626	167,644
Total pork	....	106,085,977	....	130,392,772	....	124,409,626	....	121,024,224	....	108,484,659
Sausage and sausage meat, pounds..	6,061,508	671,241	7,926,730	881,686	8,000,973	925,877	8,367,496	909,472	8,538,058	997,655
Sausage casings	....	2,646,868	....	2,572,479	....	3,422,271	....	3,959,384	....	3,520,191
All other	....	2,267,359	....	2,633,986	....	2,708,632	....	2,659,228	....	1,783,331
Total packing-house products.	....	170,308,231	....	207,673,774	....	203,456,136	....	196,187,091	....	169,991,850
Poultry and game	....	897,425	....	1,397,004	....	1,086,618	....	881,792	....	848,644
Quills	....	1,618	....	150	....	....	....	....	....	....
Silk waste. (*See* Fibers, animal.)										
Wool. (*See* Fibers, animal).										
Total animal matter	....	224,000,796	....	268,804,107	....	254,798,320	....	238,552,154	....	199,046,078
VEGETABLE MATTER.										
Breadstuffs. (*See* Grain and grain products.)										
Broom corn	....	227,066	....	240,164	....	268,812	....	266,696	....	304,522
Cider .... gallons..	394,723	61,204	344,117	53,577	197,514	30,681	172,617	26,401	87,630	14,121
Cocoa, ground or prepared, and chocolate	....	279,819	....	349,107	....	376,467	....	403,509	....	471,458

Coffee:										
Green or raw.............pounds..	15,559,235	1,966,107	28,346,323	3,483,238	38,771,906	4,692,137	35,356,109	4,314,020	28,630,278	3,729,840
Roasted or prepared.........do....	550,016	82,451	838,181	117,749	2,261,517	297,280	4,301,029	474,451	986,100	155,776
Total.................do....	16,109,251	2,048,558	29,184,504	3,600,987	41,033,423	4,989,417	39,657,138	4,788,471	29,616,378	3,885,616
Cotton:										
Sea Island.............bales....	42,721	8,365,448	42,271	3,335,022	20,173	2,075,446	33,042	3,351,132	25,939	2,035,120
Sea Island.............pounds..	16,653,124		16,245,924		7,605,804		12,699,567		9,740,806	
Upland.................bales....	8,295,243	376,599,566	a7,008,085	a397,670,899	a8,688,296	a479,202,351	a7,401,538	a434,437,070	a8,551,789	a415,355,545
Upland.................pounds..	4,288,195,779		a3,617,799,246		a4,510,611,416		a3,804,209,126		4,438,244,396	
Linters....................do....	84,473,174	1,433,925	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Total.................do....	4,339,322,077	381,398,939	3,634,045,170	401,005,921	4,518,217,220	481,277,797	3,810,998,693	437,788,202	4,447,985,202	417,390,665
Flavoring extracts and fruit juices......	....	....	....	52,490	....	48,491	....	52,395	....	64,418
Flowers, cut....................	....	4,522	....	3,496	....	2,579	....	1,784	....	4,433
Forest products:										
Bark, and extract of, for tanning—										
Bark.................pounds..	(c)	(c)	4,873,237	75,084	2,322,130	29,975	3,987,330	57,515	3,845,600	56,572
Bark, extracts of..............	....	(c)	....	356,847	....	305,998	....	241,608	....	260,965
Total.....................	....	552,909	....	431,931	....	335,973	....	299,123	....	317,537
Charcoal........................	....	23,479	....	14,727	....	7,956	....	4,271	....	13,360
Moss............................	....	(c)	....	37,201	....	40,578	....	33,742	....	39,284
Naval stores—										
Rosin.................barrels..	2,310,275	7,069,084	2,438,556	9,899,080	2,560,966	11,327,091	2,712,732	11,395,126	2,170,177	8,004,838
Tar....................do....	20,291	60,520	16,821	55,302	16,792	57,215	14,091	53,983	11,072	46,442
Turpentine and pitch....do....	24,971	74,938	14,232	43,875	19,830	60,563	13,448	46,339	10,034	31,809
Turpentine, spirits of..gallons..	15,894,813	8,902,101	15,981,253	10,077,268	15,854,676	10,241,883	19,532,583	10,146,151	17,502,028	7,018,058
Total.....................	....	16,106,643	....	20,075,585	....	21,686,752	....	21,641,599	....	15,101,147
Wood—										
Logs d........................	....	3,040,846	....	3,806,300	....	3,645,180	....	4,337,766	....	2,846,863
Lumber—										
Boards, deals, and planks, M feet..................	1,283,406	24,483,214	1,344,607	28,695,823	1,623,964	39,861,352	1,548,130	35,607,508	1,357,822	29,056,579
Joists and scantling.M feet.	47,309	704,306	29,119	501,711	34,851	752,152	27,332	581,718	22,122	378,914
Shingles...............M..	24,345	69,351	26,272	73,635	18,256	53,261	20,483	75,535	14,104	61,784
Shooks—										
Box.......................	....	825,145	....	954,268	....	939,724	....	958,127	....	957,682
Other........number..	872,192	1,278,972	1,066,253	1,524,549	803,346	1,409,595	900,812	1,716,130	977,376	1,962,199
Total shooks.......	....	2,104,117	....	2,478,817	....	2,349,319	....	2,674,317	....	2,919,881

a Including linters. b Included in "Upland." c Not stated. d Prior to 1909 including firewood and other unmanufactured wood.

Agricultural exports (domestic) of the United States during the five years ending June 30, 1909—Continued.

Article exported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Forest products—Continued.										
Wood—Continued.										
Lumber—Continued.										
Staves and heading—										
Heading		$148,042		$201,219		$157,553		$176,430		$154,766
Staves ... number	48,286,285	3,613,635	57,586,378	4,699,877	51,120,171	5,127,522	61,696,949	6,016,690	52,583,016	5,524,199
Total staves and heading		3,761,677		4,901,096		5,285,075		6,193,120		5,678,965
Other		3,068,115		3,317,164		3,578,452		5,216,854		5,461,866
Total lumber		34,190,679		39,968,246		51,879,611		50,349,052		43,557,989
Timber—										
Hewn ... cubic feet	3,856,623	913,654	3,517,046	877,786	3,278,110	890,106	4,883,506	1,316,465	2,950,528	839,011
Sawed ... M feet	486,411	7,294,168	532,548	10,649,310	600,865	13,101,178	463,440	11,040,677	383,309	8,414,519
Total timber		8,207,822		11,527,096		13,991,284		12,357,142		9,253,530
All other, including firewood		(a)		(a)		(a)		(a)		479,996
Total wood		45,439,347		55,361,642		69,516,075		67,043,960		56,138,378
Wood alcohol ... proof galls.	1,097,451	603,385	780,222	466,467	2,150,311	862,819	1,958,630	819,753	1,100,495	383,788
Wood pulp ... pounds	23,703,906	473,585	29,482,434	587,878	25,079,946	498,552	23,845,732	519,625	20,650,756	448,960
Total forest products		63,199,848		76,975,431		92,948,705		90,302,073		72,442,454
Fruits:										
Fresh or dried—										
Apples, dried ... pounds	39,272,690	2,208,414	27,852,831	2,044,820	45,697,948	3,166,946	24,237,873	1,946,810	33,474,634	2,339,936
Apples, fresh ... barrels	1,499,942	3,659,875	1,208,989	3,751,375	1,539,267	4,652,966	1,049,545	3,660,854	896,279	2,782,007
Apricots, dried ... pounds	6,854,154	606,777	13,760,281	1,325,422	2,760,432	336,812	1,224,602	229,467	16,597,871	1,512,417
Oranges ... boxes	(b)	929,151	(b)	1,110,993	(b)	1,255,104	654,251	1,577,661	866,753	2,131,724
Peaches, dried ... pounds	(b)	(b)	1,181,649	110,407	1,767,650	186,043	1,148,598	144,318	2,403,430	151,884
Pears, fresh		(b)		631,972		675,944		298,918		546,198
Prunes ... pounds	54,993,849	2,455,056	24,869,744	1,410,636	44,400,104	2,400,960	28,148,450	1,642,114	22,602,288	1,078,210

Raisins..........do....	7,054,824	372,087	4,528,502	305,768	9,128,827	599,398	5,684,541	427,583	7,880,161	455,657
Other........		2,253,638		1,727,943		2,246,384		2,360,360		2,104,624
Total fresh or dried........		12,684,498		12,419,336		15,520,557		12,278,085		13,102,107
Preserved—										
Canned........		2,541,025		2,348,064		1,581,047		1,540,826		2,899,374
Other........		71,868		89,872		104,663		137,929		77,746
Total preserved........		2,612,893		2,437,936		1,685,710		1,687,755		2,977,120
Total fruits........		15,297,391		14,857,272		17,206,267		13,965,840		16,079,227
Ginseng..........pounds..	146,576	1,068, 840	160,949	1,175,844	117,606	813,023	154,180	1,111,994	186,257	1,270,179
Glucose and grape sugar:										
Glucose..........do....	175,250,580	3,206,794	189,656,011	3,489,192	151,629,441	3,017,527	98,608,192	1,898,652	92,652,409	1,938,406
Grape sugar..........do....							31,078,642	641,988	19,572,095	407,683
Grain and grain products:										
Grain—										
Barley..........bushels..	10,861,655	5,585,544	17,729,360	8,653,231	8,238,842	4,556,295	4,349,078	3,205,528	6,580,393	4,672,166
Buckwheat..........do....	316,399	209,941	696,513	449,129	199,429	128,837	116,127	94,638	186,702	137,413
Corn (maize)..........do....	88,807,223	47,446,921	117,718,657	62,001,856	83,300,708	44,261,816	52,445,800	33,942,197	35,853,412	25,194,406
Oats..........do....	5,479,308	2,085,992	46,324,035	16,234,918	4,014,042	1,670,881	1,158,622	624,560	1,510,320	804,759
Rye..........do....	1,423	1,191	1,355,528	905,350	749,455	562,016	2,419,958	2,184,335	1,272,559	1,049,809
Wheat..........do....	4,894,402	3,905,579	34,973,291	28,757,517	76,569,423	60,214,388	100,371,057	99,736,767	66,923,244	68,094,447
Total grain..........do....	109,660,410	59,235,168	218,798,284	117,062,001	173,071,899	111,394,233	160,860,642	139,788,034	112,326,630	99,953,060
Grain products—										
Bran, *middlings*, and *mill feed*, tons........	38,203	722,582	99,418	2,052,285	92,675	3,115,848	116,917	3,004,174	45,737	1,222,406
Breadstuff preparations—										
Bread and biscuit..pounds..	11,887,843	645,909	11,193,643	660,252	11,886,745	696,025	13,052,074	766,170	12,606,614	710,687
Other........		2,064,790		2,208,585		1,942,238		1,885,915		1,858,646
Total breadstuff preparations........		2,710,699		2,868,837		2,638,263		2,652,085		2,569,333
Distillers' and brewers' grains and malt sprouts........tons..	75,540	1,485,671	102,683	1,937,315	84,581	1,617,850	65,682	1,424,677	75,503	1,758,404
Malt..........bushels..	487,158	342,851	891,523	598,453	414,515	278,448	224,991	201,554	163,230	147,258
Meal and flour—										
Corn meal..........barrels..	371,565	1,113,295	543,794	1,623,397	766,680	2,313,410	654,515	2,053,447	452,907	1,549,010
Oatmeal..........pounds..	52,476,917	1,423,742	37,972,903	948,088	42,701,257	1,122,162	24,484,199	705,853	14,522,944	516,524

[a] Included in "Logs."   [b] Not stated.

Agricultural exports (domestic) of the United States during the five years ending June 30, 1909—Continued.

Article exported.	1905.		1906.		1907.		1908.		1909.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
VEGETABLE MATTER—continued.										
Grain and grain products—Continued.										
Grain products—Continued.										
Meal and flour—Continued.										
Rye flour.........barrels..	4,721	$19,618	5,383	$20,019	3,377	$10,879	4,105	$16,521	3,857	$14,600
Wheat flour..........do....	8,826,335	40,176,130	13,919,048	59,106,809	15,584,667	62,175,397	13,927,247	64,170,508	10,521,161	51,157,360
Total meal and flour.....	....	42,732,791	....	61,699,373	....	65,621,848	....	66,946,329	....	53,237,500
All other......................	....	845,999	....	850,090	....	732,660	....	1,445,289	....	1,188,518
Total grain products.........	....	48,840,593	....	70,005,353	....	73,004,917	....	75,674,108	....	60,123,419
Total grain and grain products..........................	....	108,075,761	....	187,067,354	....	184,399,150	....	215,462,142	....	160,076,479
Grasses, dried..........................	....	11,138	....	9,805	....	11,670	....	1,206	....	....
Hay.................................tons..	66,557	1,080,505	70,172	1,116,307	58,602	976,287	77,281	1,463,010	64,641	1,147,753
Hops..............................pounds..	14,858,612	4,480,666	13,026,904	3,126,843	16,809,534	3,531,972	22,920,480	2,963,167	10,446,884	1,271,629
Lard compounds. (*See* Meat and meat products.)										
Liquors, alcoholic:										
Distilled spirits—										
Alcohol, including cologne spirits.........proof gallons..	1,081,871	223,664	504,665	103,833	428,107	70,814	235,752	53,793	103,932	36,719
Brandy..................do....	21,171	18,217	5,145	8,553	14,172	22,496	2,750	4,900	14,718	12,262
Rum.....................do....	911,371	1,175,837	701,423	877,922	914,074	1,191,418	938,331	1,232,179	926,049	1,237,118
Whisky—										
Bourbon..............do....	212,001	246,115	183,621	245,264	190,067	253,222	129,258	160,914	331,909	365,446
Rye.....................do....	106,893	207,606	109,522	207,783	134,110	252,918	172,755	320,935	121,320	210,031
Total whisky.......do....	318,894	453,721	293,143	453,047	324,177	506,140	302,013	481,849	453,229	575,477
Other.......................do....	83,771	97,328	40,089	81,870	19,779	38,889	28,391	43,566	11,204	22,391
Total distilled spirits..do....	2,417,078	1,968,767	1,544,465	1,525,225	1,700,309	1,827,757	1,507,237	1,816,287	1,509,132	1,883,967
Malt liquors—										
Bottled.........dozen quarts..	826,400	932,372	727,731	1,059,584	743,163	1,128,226	643,230	964,207	635,361	984,992

Unbottled ....gallons..	354,097	80,436	256,575	57,192	356,788	87,114	272,949	55,965	246,525	45,795
Total malt liquors............	....	1,012,808	....	1,118,776	....	1,215,340	....	1,020,172	....	1,010,787
Wines—										
Bottled.........dozen quarts..	5,800	28,242	5,596	25,215	4,404	20,128	6,273	30,830	3,839	19,902
Unbottled............gallons..	339,386	355,215	789,526	326,335	560,147	251,353	438,676	195,160	415,891	181,516
Total wines.................	....	383,457	....	351,550	....	271,481	....	225,990	....	201,418
Total alcoholic liquors........	....	3,365,032	....	2,993,551	....	3,314,578	....	3,062,449	....	3,096,172
Malt. (*See* Grain and grain products.)										
Malt liquors. (*See* Liquors, alcoholic.)										
Malt sprouts. (*See* Grain and grain products.)										
Nursery stock........................	....	219,223	....	242,056	....	225,339	....	247,844	....	317,827
Nuts:										
Peanuts.................pounds..	(a)	(a)	7,180,163	275,927	6,386,012	278,236	5,503,685	283,819	5,501,107	242,569
Other............................	....	(a)	....	140,959	....	103,929	....	89,205	....	246,284
Total nuts......................	....	309,195	....	416,886	....	382,165	....	373,024	....	488,853
Oil cake and oil-cake meal:										
Corn......................pounds..	24,171,127	278,526	48,420,942	605,346	56,808,97[illegible]	677,156	66,127,704	801,787	53,233,890	727,355
Cotton seed..................do....	1,251,907,996	13,897,178	1,110,834,678	13,073,100	1,340,967,138	17,062,594	929,287,467	11,889,415	1,233,750,327	15,805,433
Flaxseed, or linseed..........do....	618,498,525	7,600,907	758,916,364	10,313,118	665,936,164	8,675,877	696,135,362	9,175,559	682,764,545	9,303,346
Total...........................	1,894,577,648	21,776,611	1,918,171,984	23,991,564	2,003,712,272	26,415,627	1,691,550,533	21,866,761	1,969,748,762	25,836,134
Oils, vegetable:										
Fixed or expressed—										
Corn...................gallons.	3,108,917	890,937	3,833,251	1,172,206	3,041,289	1,083,929	3,659,330	1,456,120	3,258,889	1,293,580
Cotton seed..............do....	51,535,580	15,125,802	43,793,519	13,673,370	41,830,304	17,074,403	41,019,991	17,226,451	51,087,329	20,851,380
Linseed...................do....	282,188	125,354	312,766	150,395	450,208	203,712	367,883	172,083	273,029	140,876
Other..........................	....	139,219	....	244,267	....	430,965	....	206,993	....	249,360
Total fixed or expressed........	....	16,281,312	....	15,240,238	....	18,793,009	....	19,061,647	....	22,535,196
Volatile, or essential—										
Peppermint..........pounds..	36,953	135,060	74,151	206,261	147,722	499,082	141,617	357,555	161,811	288,318
Other..........................	....	215,860	....	459,532	....	258,423	....	214,765	....	274,536
Total volatile, or essential....	....	350,920	....	665,793	....	757,505	....	572,320	....	562,854
Total vegetable oils..........	....	16,632,232	....	15,906,031	....	19,550,514	....	19,633,967	....	23,098,050

a Not stated.

Agricultural exports (domestic) of the United States during the five years ending June 30, 1909—Continued.

Article exported.	1905. Quantity.	1905. Value.	1906. Quantity.	1906. Value.	1907. Quantity.	1907. Value.	1908. Quantity.	1908. Value.	1909. Quantity.	1909. Value.
VEGETABLE MATTER—continued.										
Rice, rice meal, etc.:										
Rice.....pounds..	74,866,965	$2,254,446	3,969,722	$188,853	2,443,008	$84,681	2,195,947	$87,687	1,566,531	$60,814
Rice bran, meal, and polish, pounds....	38,415,795	266,891	34,172,831	255,265	27,731,363	259,521	26,248,468	236,070	18,944,898	171,589
Rice hulls.....	.....	.....	.....	101,754	.....	113,071	.....	150,011	.....	119,279
Total.....pounds..	113,282,760	2,521,337	.....	495,872	.....	457,273	.....	473,768	.....	351,682
Root beer.....dozen quarts..	332	858	3,276	3,615	1,756	1,846	330	441	(a)	(a)
Roots, herbs, and barks, n. e. s.....	.....	389,083	.....	364,411	.....	413,799	.....	435,041	.....	395,801
Seeds:										
Cotton.....pounds..	21,101,129	235,833	23,717,328	268,330	17,628,111	209,493	28,478,473	353,213	51,626,741	632,561
Flaxseed, or linseed.....bushels..	1,338	1,738	5,988,519	7,495,748	6,336,810	7,990,383	4,277,313	5,721,337	882,899	1,092,539
Grass seed—										
Clover.....pounds..	10,667,365	1,114,015	2,265,760	267,258	3,989,798	420,104	3,547,747	579,1[illegible]9	16,186,133	1,706,780
Timothy.....do....	16,141,269	584,618	11,247,090	385,454	18,616,834	813,224	25,550,134	1,247,960	23,346,614	1,009,557
Other.....	.....	303,989	.....	217,995	.....	397,493	.....	495,245	.....	474,519
Total grass seed.....	.....	2,002,622	.....	870,707	.....	1,630,821	.....	2,322,404	.....	3,190,856
All other seeds.....	.....	317,554	.....	277,877	.....	263,912	.....	286,734	.....	340,667
Total seeds.....	.....	2,557,747	.....	8,912,662	.....	10,094,609	.....	8,683,688	.....	5,256,623
Spices.....	.....	32,372	.....	66,970	.....	50,111	.....	43,587	.....	38,444
Spirits, distilled. (See Liquors, alcoholic.)										
Starch.....pounds..	61,450,444	1,430,572	66,574,881	1,490,797	51,334,580	1,126,465	48,125,851	1,142,054	33,228,278	780,155
Straw.....	.....	7,342	.....	7,381	.....	7,482	.....	6,552	.....	8,293
Sugar, molasses, and sirup:										
Molasses.....gallons.	4,384,863	591,879	10,205,885	977,097	3,193,322	297,493	3,320,419	425,757	3,973,908	440,225
Sirup.....do....	13,337,423	2,076,200	12,835,645	1,975,856	14,115,819	2,050,964	13,181,095	1,961,670	13,865,756	2,243,201
Sugar—										
Raw.....pounds..	25,099	969	276,556	7,797	58,587	1,812	13,235	523	60,882	1,742

Refined.................do....	18,322,978	745,639	21,899,290	823,221	21,179,016	829,350	25,497,358	973,661	79,885,415	2,783,334
Total sugar...........do....	18,348,077	746,608	22,175,846	831,018	21,237,603	831,162	25,510,643	974,184	79,946,297	2,786,076
Total sugar, molasses, and sirup.........................		3,414,687		3,783,971		3,179,619		3,361,611		5,468,502
Teazels.....................................		6,929		5,012		550		2,056	(a)	(a)
Tobacco:										
Leaf.......................pounds..	328,232,009	29,644,547	302,333,075	28,002,452	321,548,309	33,193,881	323,033,034	34,342,293	282,688,917	30,757,931
Stems and trimmings........do....	6,070,082	156,269	9,894,127	205,915	9,194,556	183,517	7,779,624	384,864	5,212,029	144,969
Total....................do....	334,302,091	29,800,816	312,227,202	28,808,367	340,742,864	33,377,398	330,812,658	34,727,157	287,900,946	30,902,900
Vegetables:										
Fresh or dried										
Beans and pease......bushels..	330,331	730,922	447,474	960,710	435,400	932,264	306,930	708,201	298,209	702,819
Onions..................do....	234,048	209,938	205,102	182,060	257,747	217,582	174,820	184,166	366,989	318,051
Potatoes...............do....	1,163,270	750,210	1,000,326	743,993	1,530,461	1,278,034	1,203,894	1,077,612	763,651	715,701
Total fresh or dried.....do....	1,727,639	1,691,070	1,652,902	1,886,763	2,223,698	2,427,880	1,685,653	1,969,979	1,428,849	1,736,571
Prepared or preserved—										
Canned................................		580,046		658,739		598,628		621,987		728,111
Other.................................		929,742		1,021,625		981,325		1,303,328		1,295,784
Total prepared or preserved..		1,509,790		1,680,364		1,579,953		1,925,315		2,023,895
Total vegetables..............		3,200,860		3,567,127		4,007,833		3,895,294		3,760,466
Vinegar......................gallons..	111,994	17,158	92,027	16,266	81,752	13,274	109,263	15,841	106,903	15,100
Wines. (*See* Liquors, alcoholic.)										
Yeast......................................		21,215		23,099		38,465		37,658		50,455
Total vegetable matter, including forest products..................		666,103,329		784,218,428		892,555,792		860,206,323		776,634,500
Total vegetable matter, excluding forest products..................		602,363,981		707,242,907		799,607,087		778,844,250		704,192,046
Total agricultural exports, including forest products..............		890,104,125		1,053,022,535		1,147,354,121		1,107,758,477		975,680,576
Total agricultural exports, excluding forest products..............		826,904,777		976,047,104		1,054,405,416		1,017,396,404		903,238,122

a Not stated.

DISTANCE TRAVELED AND AREA COVERED IN PLOWING.

Width of furrow.	Distance traveled in plowing 1 acre.	Area plowed in 16 miles travel.	Area plowed in 18 miles travel.	Turns made in plowing 1 square acre.	Turns made in plowing 1 acre twice as long as wide.	Width of furrow.	Distance traveled in plowing 1 acre.	Area plowed in 16 miles travel.	Area plowed in 18 miles travel.	Turns made in plowing 1 square acre.	Turns made in plowing 1 acre twice as long as wide.
Inches.	*Miles.*	*Acres.*	*Acres.*	*No.*	*No.*	*Inches.*	*Miles.*	*Acres.*	*Acres.*	*No.*	*No.*
7	14.143	1.131	1.273	715	505	46	2.152	7.434	8.364	108	76
8	12.375	1.293	1.455	626	442	47	2.106	7.596	8.545	106	75
9	11.000	1.455	1.636	556	393	48	2.062	7.758	8.727	104	73
10	9.900	1.616	1.818	500	354	49	2.020	7.919	8.909	102	72
11	9.000	1.778	2.000	455	321	50	1.980	8.081	9.091	100	70
12	8.250	1.939	2.182	417	295	51	1.941	8.242	9.273	98	69
13	7.615	2.101	2.364	385	272	52	1.904	8.404	9.455	96	68
14	7.071	2.263	2.545	357	252	53	1.868	8.566	9.636	94	66
15	6.600	2.424	2.727	333	236	54	1.833	8.727	9.818	92	65
16	6.188	2.586	2.909	313	221	55	1.800	8.889	10.000	91	64
17	5.824	2.747	3.091	294	208	56	1.768	9.051	10.182	89	63
18	5.500	2.909	3.273	278	196	57	1.737	9.212	10.364	87	62
19	5.211	3.071	3.455	263	186	58	1.707	9.374	10.545	86	61
20	4.950	3.232	3.636	250	177	59	1.678	9.535	10.727	84	60
21	4.714	3.394	3.818	238	168	60	1.650	9.697	10.909	83	59
22	4.500	3.556	4.000	227	160	61	1.623	9.859	11.091	82	58
23	4.304	3.717	4.182	217	153	62	1.597	10.020	11.273	80	57
24	4.125	3.879	4.364	208	147	63	1.571	10.182	11.455	79	56
25	3.900	4.040	4.545	200	141	64	1.547	10.343	11.636	78	55
26	3.808	4.202	4.727	192	136	65	1.523	10.505	11.818	77	54
27	3.667	4.364	4.909	185	131	66	1.500	10.667	12.000	75	53
28	3.536	4.525	5.091	178	126	67	1.478	10.828	12.182	74	52
29	3.414	4.687	5.273	172	122	68	1.456	10.990	12.364	73	52
30	3.300	4.848	5.455	166	118	69	1.435	11.152	12.545	72	51
31	3.194	5.010	5.636	161	114	70	1.414	11.313	12.727	71	50
32	3.094	5.172	5.818	156	110	71	1.394	11.475	12.909	70	49
33	3.000	5.333	6.000	151	107	72	1.375	11.636	13.091	69	49
34	2.912	5.495	6.182	147	104	73	1.356	11.798	13.273	68	48
35	2.829	5.657	6.364	143	101	74	1.338	11.960	13.455	67	47
36	2.750	5.818	6.545	139	98	75	1.320	12.121	13.636	66	47
37	2.676	5.980	6.727	135	95	76	1.303	12.283	13.818	65	46
38	2.605	6.141	6.909	131	93	77	1.286	12.444	14.000	65	45
39	2.538	6.303	7.091	128	90	78	1.269	12.606	14.182	64	45
40	2.475	6.465	7.273	125	88	79	1.253	12.768	14.364	63	44
41	2.415	6.626	7.455	122	86	80	1.238	12.929	14.545	62	44
42	2.357	6.788	7.636	119	84	81	1.222	13.091	14.727	61	43
43	2.302	6.949	7.818	116	82	82	1.207	13.253	14.909	61	43
44	2.250	7.111	8.000	113	80	83	1.193	13.414	15.091	60	42
45	2.200	7.273	8.182	111	78	84	1.179	13.576	15.273	59	42

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